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ELECTRICAL REVIEW

VOL. CLII 2nd JANUARY, 1953 No. 1

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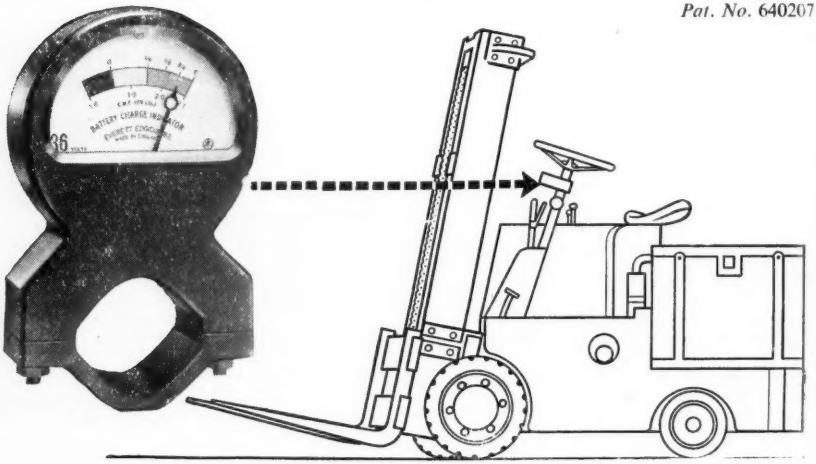

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ELECTRICAL REVIEW 2nd JANUARY, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLII • NO. 1

Productivity Problems

COMMENTS were made by "Reflector" in the *Electrical Review* of 24th October on an article in *Electron*, the official journal of the Electrical Trades Union. In this article the view was expressed that the approach to the problem of increased productivity would have to be considered in the light of this country's changed economic circumstances. The comment of "Reflector" was that it was this alteration of circumstances which had heightened the need for improved productivity.

This opinion is dealt with in the December *Electron* in a reasonable way. The writer says that the need for increased efficiency in industry was not criticized; the Union, like the *Electrical Review*, is "all for it." What is criticized is the idea that productivity alone is the cure for all our economic ills. It is contended that the present position is not solely due to inefficient production methods and obsolete plant. Reference is made to the "gathering economic crisis" in the United States in support of this thesis. Not lack of productive power but lack of markets is the real problem. Increased production, it is suggested, would aggravate the trouble, for "capitalist production whether in Europe, America or in Japan, has not now an expanding market for its products but a market that is steadily contracting." The result is likely to be cut-throat competition and an even worse crisis.

If this view is accepted, it seems obvious that improved productivity is even more essential if we are to produce goods competitively. Productivity must not be confused with the volume of production. If export trade contracts, the reduced requirements must be more efficiently produced. This unfortunately must mean that fewer people will be employed in production; in fact improved productivity without increased sales carries with it the implication of reduced employment.

But is the E.T.U.'s prognostication correct? Is it not accepted in "capitalist" circles that there are illimitable prospects of

expansion among the vast numbers of "backward" peoples? And not among these alone: there is great scope for development in the more advanced countries. The E.T.U. says that the capitalist countries have "deliberately" cut themselves off from one-third of the world's population. Without accepting this explanation of the origin of the "Iron Curtain," it is still possible to imagine a resumption of trade relations with Russia and China. So much optimism may be hard to justify at present but in time commonsense must triumph over political antagonisms if the world is to go on.

TRADE PRACTICES

The Board of Trade has asked the Monopolies and Restrictive Practices Commission to report on the general effect upon the public interest of certain trade practices. This relates to practices in the industries on which the Commission has already reported and, in general, covers the granting by suppliers of special terms and discounts to specified classes of buyer and the withholding of supplies from specified persons. It does not cover patentee and licensee arrangements, or agreements between a particular supplier and a purchaser to which no other persons are parties, agreements between interconnected parties, or the allocation of markets on a territorial basis. Any action to give effect to the Commission's recommendations will require special legislation. The Commission has already commented upon arrangements existing in the electric lamp and cable-making industries and to that extent its views may be said to be already known.

EVEN FOGGIER

After the dreadful fog which enveloped London for two or three days last month Dame Caroline Haslett wrote to *The Times* suggesting that a greater use of electricity would save London from repetitions of this unpleasant and costly experience. There followed a series of letters in some of which it was considered that the matter would be cleared up by the use of the new solid-fuel grates. Sir Arnold Gridley, M.P., settled this point by showing that there was a chronic shortage of smokeless fuel and these grates were therefore burning bituminous coal. Now the Coal Board is making things far worse by advocating the use of "nutty slack" for banking-up purposes.

THE 275 kV GRID

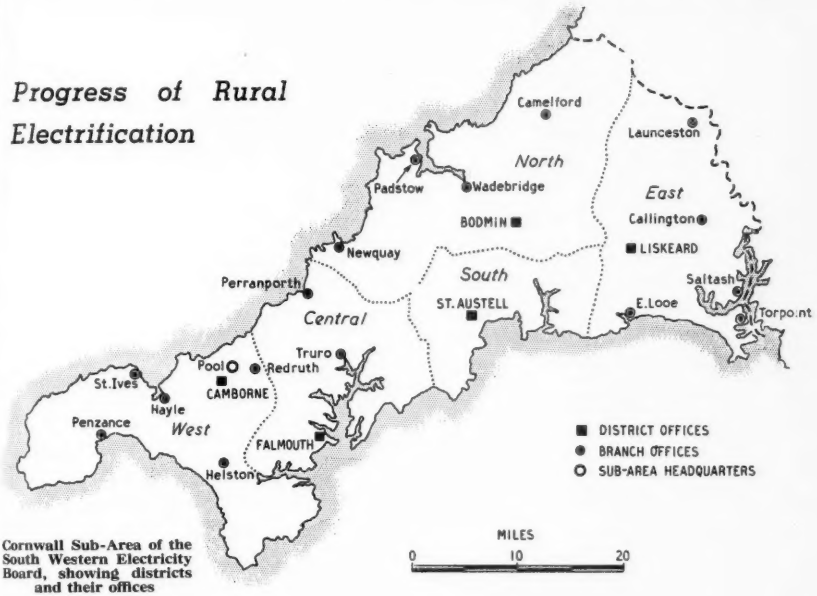
The erection of the 275 kV transmission line tower at Tilbury initiates the double circuit loop round London at that voltage. When linked with the North it should make a useful contribution to the total effective capacity of generating plant, owing to differences in times of demand between the two ends of the country. The same link will also permit the transfer to South-East England, in the form of electricity, of the large surplus of coal over local needs that exists in the Central and Mid-East England coalfields. At 275 kV the estimated cost of doing so compares very favourably with that of transporting raw coal by the railways, which would thus be materially relieved.

CORONATION ILLUMINATIONS

This year's Coronation festivities present many opportunities to electrical contractors and suppliers of decorative lighting equipment. Some idea of the scope and the available materials will be given in the 16th January issue of the *Electrical Review*. This special number will contain articles by leaders of the industry and other writers qualified to deal with the installation of lighting schemes, large and small. In addition, there will be a survey of the fittings, devices and other equipment which manufacturers are offering for the occasion.

Farming in Cornwall

Progress of Rural Electrification



Cornwall Sub-Area of the South Western Electricity Board, showing districts and their offices

IN our issue of 4th July we reported an announcement by Mr. S. F. Steward, chairman of the South Western Electricity Board, that for the first time well over 1,100 farms in the South West had been connected in one year. The full financial year's figures now available show that actually 1,174 new farm consumers were added, and this striking progress was maintained in the first six months of the current year.

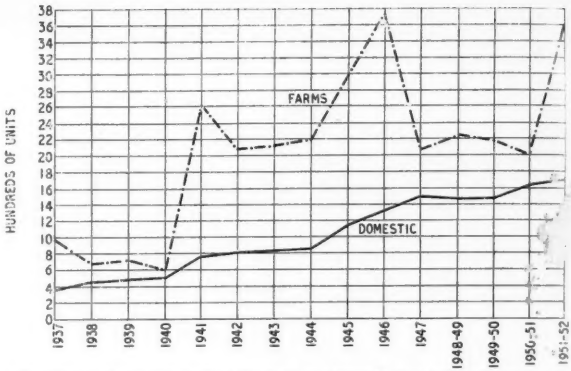
The thousandth farm connected during 1951–52, that of Mr. W. A. Ford at Liskeard, and at which Mr. Steward took part in a special ceremony, is in the Cornwall Sub-Area (manager: Mr. C. J. Hocking, M.I.E.E.; commercial officer: Mr. W. R. Rowe, A.M.I.E.E.). It is in this Sub-Area (1,249 sq miles) that no fewer than 440 of the 1,174 farms connected in 1951–52 are situated.

To learn more of this achievement we recently visited Cornwall, and in the company of Mr. Rowe and the Sub-Area agricultural engineer (Mr. L. W. Jenner, A.M.I.B.A.E.) travelled about 250 miles inspecting typical installations in the Sub-Area. There can be few areas in which one could see more varied applications of electricity, covering all aspects of dairy and poultry farming, pig rearing, grain and grass drying, market gardening and—a speciality of Cornwall—flower growing.

Throughout the area farms generally are small compared with those in other parts of the country. The average size of the 10,500 farms of 5 acres or over in the Sub-Area is 60 acres, or 40 acres if arable land only is taken into consideration. The extent of the farms is not, of course, the only criterion, especially for the more specialized branches of farming, but it must have some relation to the degree of utilization of electrical appliances. It is gratifying, therefore, to see how the small farmer is adopting the advantages of electricity to the full extent of his limited resources.

Within the past three years no fewer than

a thousand holdings (apart from 11,000 domestic and 2,000 commercial premises) have been connected, making a total of 3,800 holdings on the mains. While as a result of careful planning the latest figures show an increase in the rate of connection, the difficulties of financing rural development become more pronounced as the more thinly-populated areas are reached. Already a high proportion of the farms within 350–450 yd of the mains have been connected; above this distance the provision of supplies becomes increasingly difficult. Most of the large villages are now being supplied; therefore the bulk of future development will be in isolated groups and single premises.



Comparison of average electricity sales to domestic and farm consumers during the past fifteen years

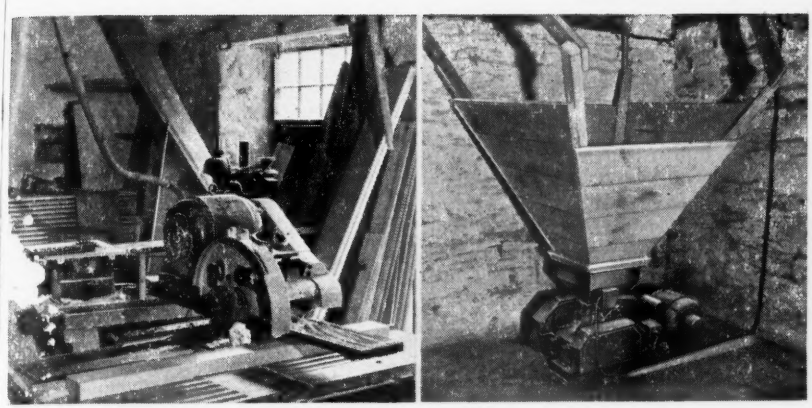
New Consumers in 1951–52

In addition to the 440 farms connected in 1951–52, 3,500 domestic and over 650 commercial and industrial consumers were given supplies, bringing the respective totals to 74,700 and 13,250. Roughly 40 per cent of the consumers are in rural areas. In general it is the practice to concentrate on the reinforcement of the network and the erection of the heavier lines in the summer months, leaving the lighter work to be carried out in winter.

The extension of supplies to the more isolated premises is being helped by the line rental scheme introduced by the Board in 1950 throughout the whole of its Area. This has superseded the guaranteed minimum payment plus capital contribution system operated before vesting date. Under the line rental scheme annual estimated revenue is set against 20 per cent of the capital cost and the balance is charged as an annual line rental. Should the actual revenue exceed the estimated revenue 25 per cent of the excess is credited to the consumer in each of the first three years, after which the whole of the excess is refunded to the consumer. The same procedure continues for the following three-year periods.

Since vesting day there has been an acceleration of progress in rural development. In the twelve months ended 31st March last, new work was undertaken

Left: **Half a million eggs a season are hatched by electric incubators on Mr. J. G. Williams' Bodlily poultry farm, Helston.** *Right:* **Bulb sterilizer for destroying eelworm and narcissus fly at Mr. Shone's intensive flower farm at Pendown Kea**



Left: **Electrically driven woodworking equipment installed at Bodilly poultry farm.** *Right:* **Oat crusher at Mr. H. R. Graham Vivian's farm**

covering 360 schemes of varying size. This involved the provision of 84 miles of h.v. and 71 miles of l.v. mains.

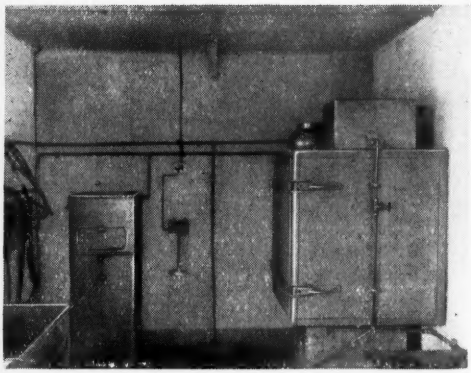
In planning future extension schemes great assistance was derived from the Board's comprehensive rural development survey of the whole area. This records the situation and type of every property without a supply in the rural areas and provides schedules of capital cost and anticipated revenue.

The special needs of the Cornish farmer are met by Mr. Jenner and a number of sales representatives specially trained in handling this problem who give technical advice. Often the first approach to the use of electricity on the farm comes through the domestic requirements of the farmer's wife. Farm electrification is very much bound up with domestic supplies in rural areas, and the Cornwall Sub-Area therefore approaches the matter largely from this angle. For this reason the accompanying diagram showing the growth of electricity consumption by domestic and farm consumers during the past fifteen years is of considerable interest. It will be seen that the kWh sold per domestic consumer rose from under 400 to 1,700, and in parallel with this increase sales per farm consumer rose from under 1,000 to 4,000 kWh.

The Sub-Area has achieved 50 per cent "saturation" in respect of cookers, which are now installed in 76,000 domestic premises and 3,800 farms. About 25 per cent of consumers have water heaters, and a further 22 per cent (many of whom have no piped water supply) wash boilers. This has been achieved by the operation of a number of sales representatives who are able to concentrate their energies in the parts of the area most particularly requiring development, which is revealed by data kept in the form of a "Premises, Consumers and Appliances" file, and this record is also used for estimating probable load sizes of transformers required, etc. Furthermore, special forms relating to farm consumers contain full details of type, stock, electrical equipment connected, etc., and make possible intensive drives for particular appliances.

Supplies for domestic purposes on farms enjoy the same rates as those for ordinary domestic premises, namely a block system with the charges falling from 5d to 2d and $\frac{3}{8}$d per kWh on a scale dependent on the number of rooms. The same three kWh charges are applicable to the farm itself; in this case the number of units assessed to be charged depends on the estimated maximum demand.

As an example, a farmhouse with 5–8 rooms, taken together with actual farming premises with an assessed demand of up to 15 kW, would be charged as follows:—The quarterly number of kWh charged at 5d per kWh is 60 for the house and 60 for the farm; the number of kWh charged at 2d per kWh is 60 for the house and 120 for the farm; all energy in excess of 300 kWh per quarter (combined farm and house) is charged at $\frac{3}{8}$d per kWh. If desired the consumer can



Well-laid-out dairy installation at Mr. H. R. Graham Vivian's farm at Bosahan Barton, showing water heater, bucket heater, churn stool and sterilizer

have separate accounts for house and farm or a combined account on a supply with one meter.

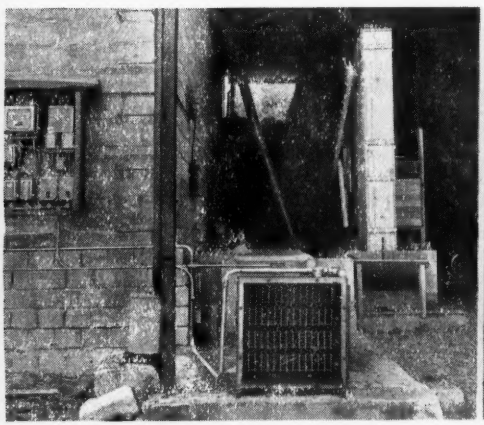
While, in general, the farmer is not yet making full use of electricity for business purposes, we saw examples in Cornwall of the extent to which some farmers are taking advantage of the supply provided. Half a million day-old chicks are produced in a season at Mr. J. G. Williams' Bodilly poultry farm at Helston which has an annual consumption of 100,000 kWh.

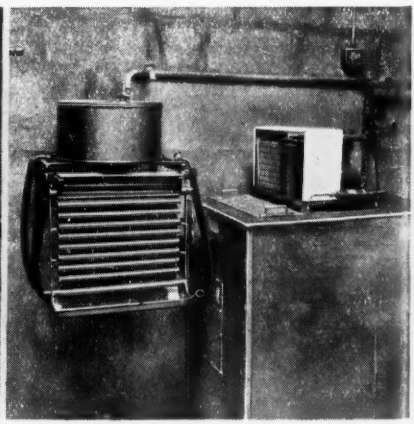
His sixteen Curfew, Buckeye, Robbins and Weston incubators ranging in size from 2,000 to 70,000 egg capacity, have a total capacity of 250,000 eggs. Setting 50,000 eggs a week from about the last week in February to the third week in May, he achieves rather more than a two-thirds hatch. Apart from the electric heating elements in the incubators themselves, fan heaters are employed to warm the air in the hatching rooms. The free range brooders are also electrically heated.

Other electrical appliances employed on this farm include a Sturtevant industrial vacuum cleaner for collecting dust and feathers; "Aerovaps" for killing flies and other insects; Ferranti clocks; and a saw, planer, drill and other woodworking equipment used for making poultry houses, etc. An 18 kW boiler is also being considered for preparing food for pig rearing, another branch of Mr. Williams' business. Altogether the installation now has a maximum demand of nearly 50 kW, which is met through a nearby 100 kW pole-mounted transformer, which also supplies several other consumers.

There is a good example of a comprehensive well-laid-out dairy installation at Mr. H. R. Graham Vivian's farm at Bosahan Barton, also near Helston. Here to help deal with thirty cows in milk there are an Alfa Laval bucket milker, a Woolley "Whizzer" steam raiser fitted with Venner time switch, a 27 cu ft sterilizer, a churn stool, a Woolley water heater, a Santon pail heater and a

Left: **100-ton in-bin grain dryer, with pre-cleaner and elevator, at Mr. L. Mitchel's Trelowthas Farm, Probus.** *Right:* **"Lo-heat" chilled water milk cooler at the same farm**

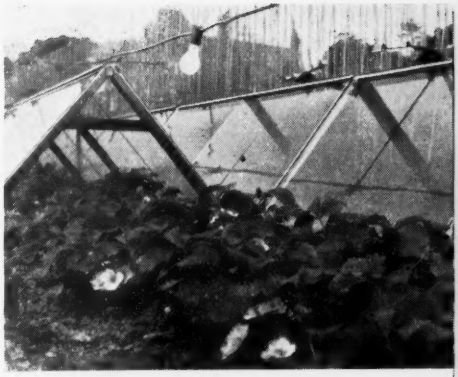




Smith's clock. A Bentall oat crusher driven by a 1 h.p. Brook motor is used for food preparation, while a 1½ h.p. motor driven pump provides water supplies.

Electricity appears to be playing a very considerable part among horticulturists, who are now making extensive use not only of soil sterilization and soil heating, but also light irradiation. By the use of light and soil heating stronger and healthier tomato plants are produced which fruit about three weeks earlier than by other methods. Earlier and larger blooms are also achieved with such flowers as tulips, carnations, camellias and anemones, while a retarding action can also be induced by a similar treatment of chrysanthemums, blooming being held back for 21–28 days or even longer.

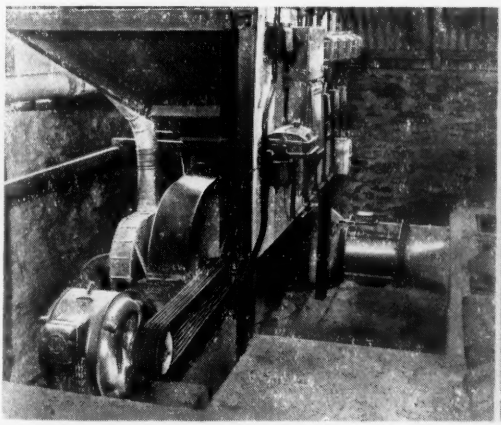
A particularly interesting and profitable field of development has been opened up by the application of combined soil heating and light irradiation to the commercial production of strawberries. At Roscarrack, Falmouth, Mr. K. Tewkesbury was able this year to start picking by the end of April, thus beating imports from France by about ten days. He had picked a ton of fruit by the second week in May. The total connected soil heating load is equivalent to 27 kW, but as it is found to be sufficient to have the heat switched on for only 8 hours out of 24 it was possible to split up the beds into three sections and take a supply from a 9 kVA " Lo-heat " transformer. Tungsten lamps (25, 60 and 100 W) at 5ft intervals along the rows were switched on from about the end of January to mid-April.

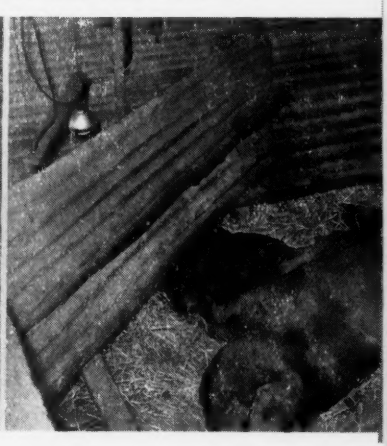


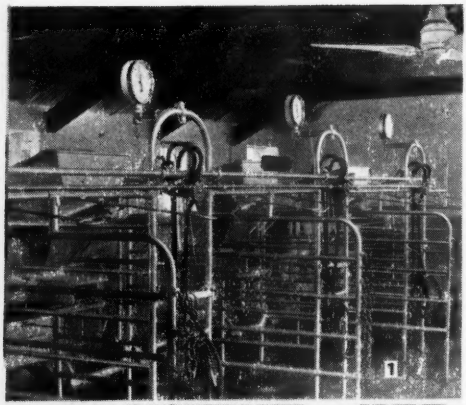
By using combined soil heating and light irradiation Mr. K. Tewkesbury, of Roscarrack, secures an early strawberry crop

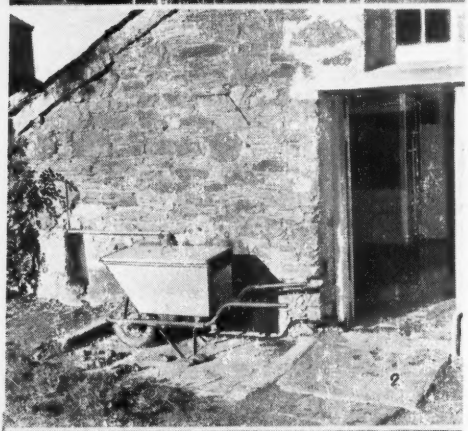
Other applications of electricity to intensive flower production were seen at Mr. Shone's 30 acre farm at Pendown Kea. Specializing in narcissi, daffodils, tulips and irises, Mr. Shone has had a ½-ton electrically heated sterilizer (12 kW loading) installed particularly for the destruction of eelworm and narcissus fly. The temperature required for this process is particularly critical and a rise of 2 deg F above the 110 deg F operating

Left: **In-sack 2-ton grain dryer and hammer mill at Mr. E. Teagle's Trevithick Farm, St. Columb.**
Right: **Infra-red lamps are used for pig rearing at Mr. T. H. Biddick's farm at St. Merryn**









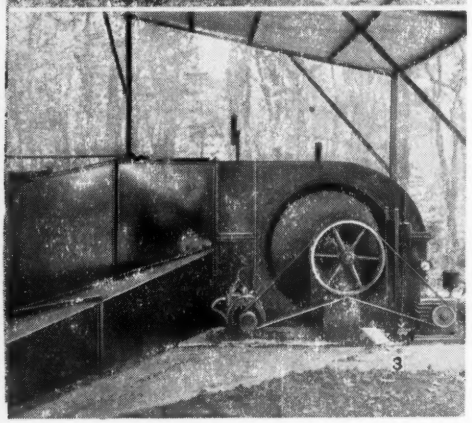


figure will kill the bulbs. For this reason the unit is fitted with a Cambridge regulating thermometer operating in conjunction with a "Satchwell" contactor. It is also important that the water should be circulated quickly around the bulbs, and a pump driven by a ½ h.p. electric motor is used for this purpose. The whole process takes three hours and this year 35 tons of bulbs have been so treated.

Blooming is also accelerated by 6–8 weeks by placing the bulbs about the middle of August in a cold store where they are kept at a temperature of 48 deg F before being planted out in September or October. This cold store, which has a capacity of 1,500 cu ft and was constructed by Mr. Shone and his staff, is served by a "Prestcold" 1½ h.p. refrigeration unit used in conjunction with a 1,000 cu ft/min fan.

The growing use of combines is reflected in the increasing popularity of grain dryers. In Cornwall to serve the eighty combines now in service there are thirty grain dryers of which seventeen are all-electric. One of the largest of these, a 100-ton in-bin unit, is to be seen at Mr. L. Mitchel's Trelowthas Farm, Probus, Truro. It includes a Boby pre-cleaner (Brook 1 h.p. motor) and a pneumatic elevator (5 h.p. English Electric motor) which blows the grain to four 25-ton bins. The dryer incorporates G.E.C. heating elements (18 kW) and a 24in 2¼ h.p. 4,600 r.p.m. "Aerofoil" fan.

At the same farm can be seen a "Loheat" chilled water unit, driven by a ½ h.p. motor, for cooling milk. The principle of chilled water milk cooling, Mr. Rowe told us, was developed largely by the former Cornwall Power Co.

An example of a 2-ton (45-hole) in-sack dryer (G.E.C.) incorporating a 48 kW heater and a 19in 2 h.p. single-stage fan was next shown to us at Trevithic Farm belonging to Mr. E. T. Teagle at St. Columb. The dryer is capable of extracting 1 per cent of moisture per hour. Erected by the side of the fan and heater bank is a hammer mill driven by a 25 h.p. English Electric motor. Unlike the majority of installations, this farm receives a three-phase supply.

(1) This parlour type recorder milking installation deals with Mr. R. Davey's herd of sixty cows. (2) Surplus steam from an "Electrobloc" steam raiser is used for steaming potatoes in a special wheelbarrow at Mr. Davey's farm. (3) 100-ton grass dryer adapted for grain drying at the same farm

(1 Blooming of bulbs is accelerated at Mr. Shone's farm by placing them in this cold store in August preparatory to planting out in September or October. (2) Portable welder in use in the workshop of Mr. Davey's Tresillian Farm, Summercourt. (3) In-sack 1-ton grain dryer utilizing old railway sleepers for the platform at Mr. B. R. Opie's Penmount Farm, Dobwalls

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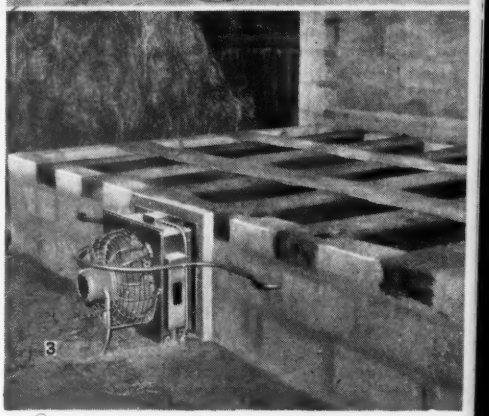
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The use of infra-red lamps to prevent overlaying and chilling of piglets and to make pigs ready for market 10–14 days earlier than usual was demonstrated to us at Mr. T. H. Biddick's farm at St. Merryn. It is the usual practice to use two of the lamps immediately after farrowing and to harden off with one only, further graduation of temperature being possible by raising or lowering the lamps. Altogether forty of these lamps are used.

Mr. Biddick also goes in for egg production on the battery system and employs electric light to extend the laying hours of his 900 hens. A Heatrae 5 gall water heater supplies him with hot water for feeding and cleaning purposes. Dressing of birds for the table is carried out by a Bingham plucking machine.

The great value of a farm workshop well equipped with electrical apparatus was clear at Mr. F. Davey's Tresillian Farm at Summercourt, near Newquay. While we were there a steel gate was being constructed with the aid of a 250 A English Electric portable welder. Also installed in the large workshops, which are equipped with fluorescent lighting, are an air compressor, lathe, hacksaw, grinder and drills.

The extensive dairy equipment on this farm, which maintains a herd of sixty cows, provides many features of interest. The Alfa Laval three-unit parlour type recorder milking installation is ideally suited for expeditiously dealing with the comparatively large number of cows. The atmosphere in the milking shed is kept fresh by means of a ceiling fan. Surplus steam from the Woolley " Electrobloc " sterilizer, used for *in situ* steaming, which is Venner time switch controlled, is employed for steaming potatoes in a specially constructed wheelbarrow. A Laycock " Merlin " machine for washing farm vehicles is another notable labour-saving appliance. Electric pumps provide both the main water supply and the water for the stock. There is a Cooper-Stewart apparatus for clipping the stock. In the barn above the dairy an " Essex " mill has been installed, the effectiveness of the pneumatic conveyor system being

shown by the remarkably long distance (50ft) between the mill and the storage bin.

A further appliance, which has been working very satisfactorily on a neighbouring farm run by Mr. Davey's son, Mr. R. Davey, is an I.C.I. Mark III 100-ton grass dryer which has been adapted for grain drying. It is oil fired but embodies electric fans.

Trewithen Farm, Grampound Road, is of more than particular interest because it is owned by one of the part-time members of the South Western Electricity Board, Mr. G. H. Johnstone, O.B.E., D.L. A firm believer in electrical methods, Mr. Johnstone has had installed, to deal with his herd of Guernseys, a Gascoigne bucket type milking machine, a 4 kW "Electrobloc" steam raiser with time switch control, a Martin sterilizer, a "Lo-heat" chilled water milk cooler, a Perkins bottle washer, and many other farm machines driven by electric motors including a 25 h.p. sawbench.

A small model of the in-sack grain dryer with twenty-one holes, capable of dealing with 1 ton of grain at a time, has been installed at Mr. Venning's farm at Penhale, Fowey. This installation has a heating load of 13 kW, the fan being driven by a $\frac{1}{6}$ h.p. motor. It is capable of removing $\frac{1}{2}$ per cent of moisture per hour.

An installation of similar equipment and capacity has been provided at Mr. B. R. Opie's Penmount Farm at Liskeard. In this case, however, about £20 has been saved in installation costs by the use of old railway sleepers instead of concrete slabs for the construction of the platform. The building work was carried out personally by Mr. Opie who has also undertaken all the other structural improvements on his farm. This year the dryer has dealt with about 1,500 sacks. Apart from the dryer, electrical equipment installed on the farm includes a Gascoigne milker, an automatic water pumping plant, an immersion heating system and an "Essex" mill. A "Rotorfreeze" in-churn milk cooler is on order.

Mr. W. A. Ford, to whose 120 acre Hendra Farm, the thousandth connected, we have already referred, has not yet had time to make extensive use of electricity. Apart from domestic equipment, which includes a "Ladybird" lawn mower, the farm is, however, already equipped with an "Essex" mill and a sheep shearing machine and arrangements are in hand for the installation of a milking machine and other dairy equipment.

We are grateful to members of the South Western Electricity Board's staff and to the farmers mentioned for their assistance in preparing this article.

"Terylene" Film

IT is now possible to make polyethylene teraphthalate, or "Terylene" as it is more commonly known, in film as well as fibre form. Imperial Chemical Industries, Ltd., holds the world rights outside the United States for the manufacture of this material which has outstanding physical and electrical properties and will no doubt find wide application in the electrical, photographic and packaging fields. Laboratory work on its manufacture has been carried out by the Plastics Division of I.C.I. at Welwyn Garden City, and a pilot plant will be in operation this year. No film will be available until the middle of the year, when small quantities for appraisal by industry will be released. Bulk quantities will not be obtainable until a large-scale plant is in operation.

The film is produced by a melt casting technique. As the viscosity of molten "Terylene" is about a fifth of that of the usual grade of polythene, the process calls for great accuracy of die manufacture and close control of temperature and die pressure. No additives whatsoever are added to the polymer during film making and the finished film is glass clear and possesses a glossy surface. The cast film, however, has a relatively low yield point and is thermally unstable, so that subsequent processing is necessary to convert it into a marketable material. This consists of drawing the film in two directions at right angles, which improves the mechanical properties of the film equally in all directions, and finally "heat setting" the drawn film by holding it in such a way that it cannot contract and heating it to temperatures of around 200 deg C.

The final film is extremely strong and tough and is thermally stable up to the setting temperature. Very thin gauge film can be made. It is expected that 0·0003in film will be available from the pilot plant; this material is quite tough and comparatively easy to handle.

The dielectric strength of "Terylene" film is $4{\cdot}5 \times 10^6$ V/in and the volume resistivity 1,017 ohms/cm. The dielectric constant at 60 c/s is 3·1–3·2 and at 10 Mc/s 3·0–3·1, while the power loss factor at 60 c/s is 0·002 and at 10 Mc/s 0·013–0·015.

Transformer Loading

Heat Run Tests as a Guide to Practical Overloads

By G. O. McLEAN, M.Eng., and R. S. PEACOCK, B.Sc.(Eng.).*

IN an article published in the *Electrical Review* of 26th December, the authors discussed the economic aspect of loading transformers above or below their maximum continuous ratings. Below they discuss conclusions they have reached from actual tests on the practical limits of overloading, and show a typical load/temperature nomogram which can be used to guide the users of transformers.

Heating Effects of Overloads

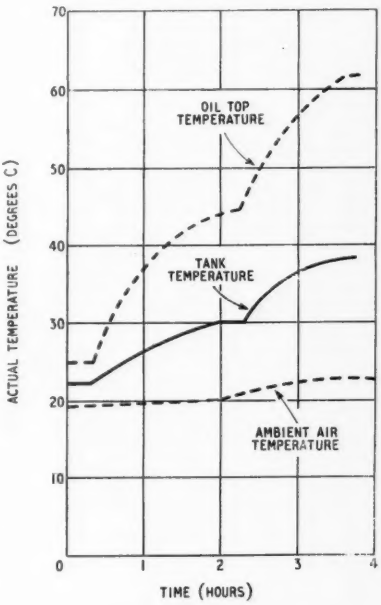
Transformer manufacturers[1] have stated that, based on their laboratory experiments, they place the limiting temperature of the hottest spot of a transformer winding at 105 deg C (221 deg F) (continuous) or 110 deg C (230 deg F) (short duration).

Temperatures in excess of these figures will cause embrittlement and eventually charring of the (paper) winding insulation.† These effects are equivalent to the premature ageing of the transformer, and the manufacturers (ibid.) state that the age is halved for every 8 deg C rise above the limit (e.g., a 30-year life becomes 15 years at 113 deg C (235 deg F) continuous and 7·5 years at 121 deg C (250 deg F) (continuous)).

The principal heating is caused by the load current in the windings, and the principal dissipation is through the insulating oil and its container to the surrounding air. Fortunately, in practice both the principal elements are variable to the extent that the load is not continuous for more than a few hours, and the surrounding air is never still but always carrying away the heat. The absolute limit even for short circuit tests is frequently stated as 250 deg C (482 deg F).

Though the natural law that heating of conductors is exponential in character is universally known, the authors feel that the effects of the large masses of iron core and insulating oil are not so well appreciated. Thus a typical transformer can have windings with a thermal time unit‡ of 7·5 minutes, while the top oil has a unit of 90 minutes.

Fig. 1.—Heating and cooling curves



* Both authors are with the South Western Electricity Board but the views expressed are purely personal.

† Tests on silicone insulated air-cooled transformers operated at high temperatures have recently been published.[2] These show a 5 per cent saving on total annual costs of paper insulated ON cooling.

‡ Thermal time unit = time constant = time to achieve maximum temperature when no heat is dissipated.

Fig. 1 shows typical heating and cooling curves for a transformer with the above characteristics when loads of 200, 50 and 100 per cent are imposed starting from a full load condition.* The principal feature

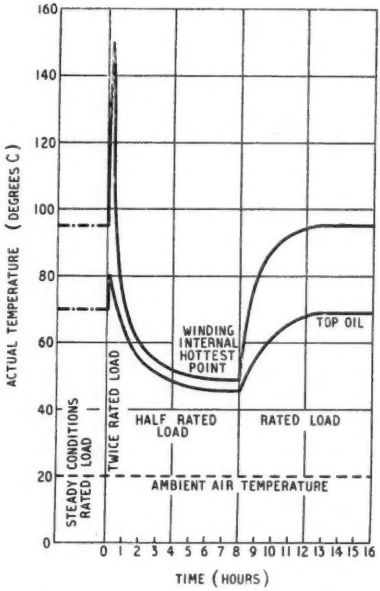


Fig. 2.—Temperatures resulting from overloads applied to a 15 kVA pole-mounted transformer

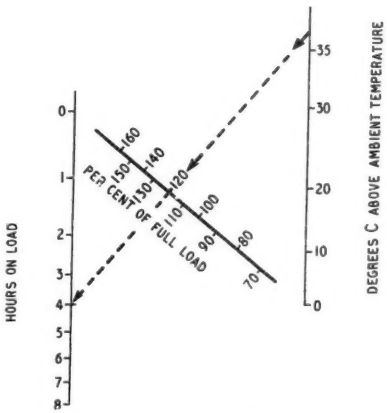


Fig. 3.—Load/temperature nomogram

stressed by all manufacturers is the temperature differential between winding and oil; the steepness of the front on the winding temperature curve is a measure of the importance of the time element when considering overloads.

It is because of this large difference in thermal time units between windings and oil that manufacturers are reluctant to allow oil temperatures to be used as a guide to overload potentialities. On the other hand, it is impracticable to measure temperature throughout the length of the winding. There has been much research work on the use and accuracy of thermal images[3] and their use is no doubt justified on large extra-high-voltage power transformers. For distribution transformers the authors believe that top oil temperature is the only practicable measurement that can be made and, because there is correlation between it and the winding temperature, supply engineers should use it as a guide when planning transformer changes.

In Situ Tests

Despite the facilities now existing with wide netting of lower voltage systems for load swinging between substations, the supply engineer cannot arrange the exact load he requires for particular transformer tests, and almost certainly not at the time or for the period required. Where two transformers of the same size are installed in the same substation, connections can be made as for a Hopkinson test, and a series of load tests carried out without too much disturbance to normal supply conditions.

Fig. 2 shows temperatures resulting from applying 150 and 200 per cent of full load to a 15 kVA pole-mounted transformer by Hopkinson methods. In these tests, only occasional temperature readings of top oil were possible, a continuous record of tank temperature being the basis for the shape of the curves. It will be noticed that steady state temperatures were attained in two hours, whereas approximately eight hours is required for larger indoor transformers.

Tests were carried out on a 100 kVA pole-mounted transformer and a 250 kVA indoor ON cooled transformer, and the results were convincing that higher overloads than previously used are practicable and that a guide based on oil temperature could be devised. The designer can, of

* Reproduced by permission from Ref. 1 (i).

course, calculate the theoretical thermal time units for any size of transformer and indicate probable temperatures, given the loading conditions; but the supply engineer often wants an immediate answer to a question such as "How long can I safely leave a 30 per cent overload on the 250 kVA transformer at A?" He can answer this question himself by constructing a nomogram as Fig. 3 for each of his standard sizes and types of transformer. Heating curves (temperature plotted against time) such as those of Figs. 1 and 2 are obtainable for any steady load, and three such curves, say, for 60, 80 and 100 per cent full load, are sufficient. A straight edge laid across the three scales gives an indication of the unknown (say, times) if the other two variables (safe temperature and load) are known. The extrapolation must not, of course, be taken too far (or in other words the scales must have reasonable limits) but the authors are convinced from their own tests that the accuracy at 40 per cent overload on the example shown is reasonable.

In conclusion, and as a result of the economic investigation and the heat tests, the following basis is suggested for a code of practice for loading distribution transformers (100 per cent = full load rating in accordance with B.S.S. 171/36):—

(a) For pole-mounted units (size limit 150 or 200 kVA) load in accordance with economic considerations, i.e., allow overloads up to 150 per cent full load. This justifies sizes of 10, 25, 50, 100 and 200 kVA.

(b) For outdoor ground-mounted units (unhindered air movement) (limit of 1 MVA) loads up to 150 per cent full load can be carried, provided ambient air temperature is below 50 deg F and daily load factor is below 0·5. Again, a size ratio of 2·0 is justified, such as 250, 500, 1,000 kVA or, if starting at 100, 200, 400 and 800.

(c) For indoor ground-mounted units, larger outdoor units, and where conditions (b) are not applicable, load up to a maximum oil temperature of 82 deg C (180 deg F).

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[2] WHITMAN, L. C.: "High Temperature Dry-Type Transformer Economics," *Elec. Eng.*, July, 1952.

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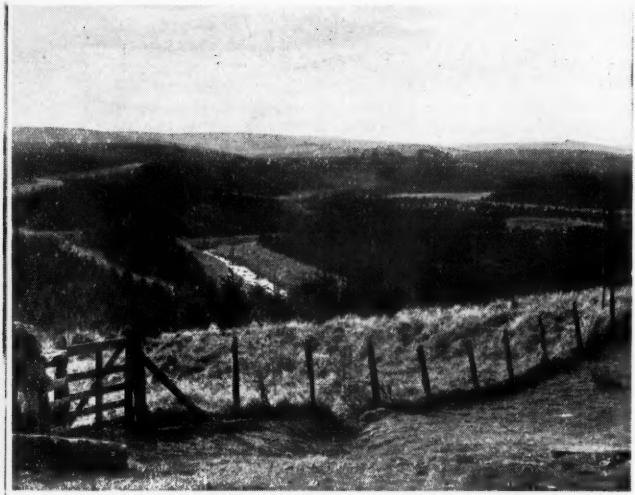
Design and the Retailer

A RESIDENTIAL course on domestic electrical equipment design for retail buyers and salesmen will be held at Urchfont Manor, Devizes (Wiltshire residential college for adult education), from 9th to 13th March. It is being organized by the college in conjunction with the Council of Industrial Design and with assistance from the British Electrical Development Association. This course offers those who buy and sell lighting, heating, cooking and other equipment an unusual chance of increasing their knowledge of the goods they handle and of discussing the importance of design to the retailer—and to the consumer who uses electrical equipment.

Among the lectures are two on design of equipment, one dealing with appearance and the other with function; two on colour and lighting in the home; and one on the social influence of electricity. The speakers include Messrs. J. A. Stedman and P. Honey (E.D.A.) and Mr. R. O. Ackerley.

Retailers wishing to enrol their staff for the course should write to the Warden, Urchfont Manor, Devizes, Wilts. The fee, inclusive of board and accommodation from Monday evening to Friday morning, is £2 10s for students resident in Wiltshire, Oxfordshire, Berkshire, Hampshire, Dorset and the Isle of Wight, and £3 10s for those who live elsewhere.



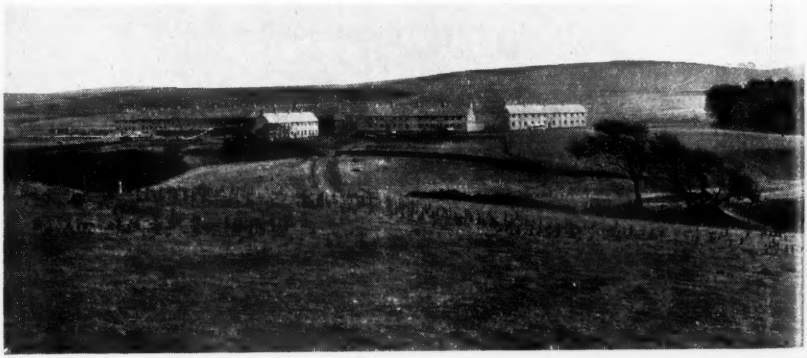
A Remote Supply

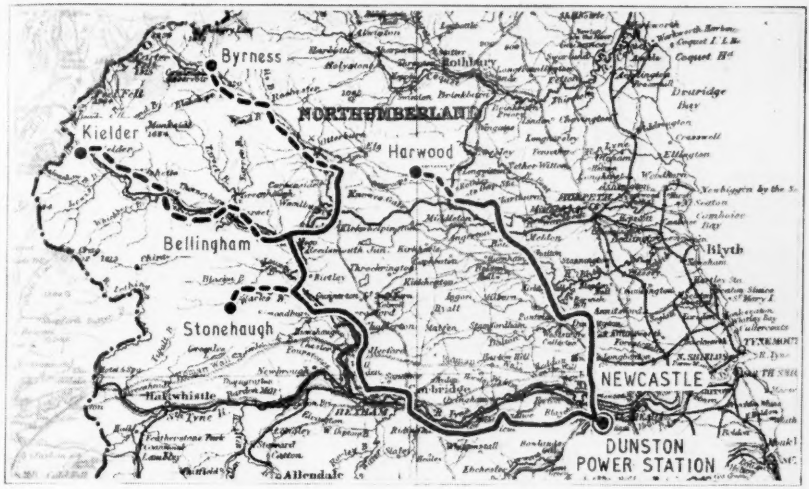
Serving a New Forestry Scheme in Northumberland

WHAT must surely be among the most isolated villages in the country will be served by a scheme now being carried out by the North Eastern Electricity Board in North West Northumberland in connection with a project of the Forestry Commission to establish in the Kielder district the largest forest area in the British Isles. Extending over 170 sq miles this forest will eventually contain about 100 million conifers and to house the appreciable number of employees required to tend the plantations several new villages are being established, the largest being at Kielder, Byrness and Stonehaugh.

When the North Eastern Electricity Board first gave consideration to the provision of an electricity supply to this remote corner of its area, the North Western Board and South West Scotland Board were approached to see whether it would be more economical for either of them to give the supply. This, however, was found not to be the case on account of the nature

Above: **A portion of the new forest area near Stonehaugh.** *Below:* **The first houses at Stonehaugh are nearing completion. The electricity supply is being brought from Wark (8 miles away by road); the h.v. line route is approximately 4¼ miles**



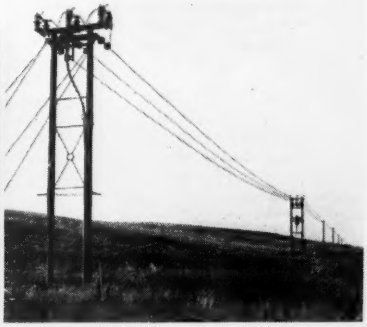


of the intervening country and the distances from the nearest sources of supply.

Eventually, therefore, schemes were prepared and approved for an extension from the nearest point of supply at Bellingham, involving the erection of 16½ miles of 20 kV 3-phase overhead line to Kielder with 12 miles of similar line from near Otterburn to Byrness and 4½ miles from Wark to Stonehaugh. The 20 kV line to supply Kielder is controlled by a pole-mounted three-shot auto-reclose circuit breaker. The line to Byrness will be similarly controlled. The auto-reclose circuit breaker on the Kielder line can be observed on the second pole in the right-hand picture below. Surge gaps protecting the circuit breaker are also provided near the top of the same pole. Smaller schemes include a 3 mile 20 kV single-phase extension from near Scots Gap to Harwood. The farthest point of supply is approximately 45 miles from the nearest power station at Dunston.

At Kielder where the ultimate develop-

Above: **Map showing the route of the 22 kV lines serving the new villages of Kielder, Byrness, Stonehaugh and Harwood.** *Below, left:* **Some of the new houses at Kielder are already completed and occupied.** *Right:* **The commencement of the new 16½ mile 20 kV line from Bellingham to Kielder**



Left: **Two 75 kVA pole-mounted transformers serving the village of Kielder.** *Right:* **20 kV line feeding Kielder Castle, Buttery Haugh Estate, the first houses of which are now being erected**

ment will comprise more than 250 houses, a school, a church, shops, etc., the electricity supply will be received through two substations. One of these (already completed) is pole-mounted and comprises two 75 kVA transformers, while the other will be brick-built with a 150 kVA transformer, provision being made for increasing the capacity of the latter ultimately to 500 kVA.

The new village at Byrness will eventually consist of 125 houses with shops, etc., and the substation capacity will at first be 75 kVA to deal with the initial housing development with provision for an increase to 500 kVA. At Stonehaugh the initial housing development will consist of thirty-six houses to be supplied from a 100 kVA substation. The ultimate development in this case will be 238 houses with shops, etc. In all cases low voltage distribution will be underground at 415/240 V.

Although the new Forestry Commission houses will have solid-fuel cooking ranges they will be equipped with electric wash-boilers and circuits are being provided for the use of auxiliary cookers as well as the usual portable appliances.

The new high voltage extensions required for providing supplies to the new villages will enable numerous existing small villages and farms en route to be supplied, and many schemes are now being prepared.

Domestic Lighting Fittings Display

MANY novel and ingenious ideas are to be seen in a collection of contemporary domestic lighting fittings on show until 10th January at the Building Centre, Store Street, Tottenham Court Road, London, W.C.1. Among the most effective innovations is the use of interlaced raffia for the shade of a floor standard by Primavera, who also make use of wood and china bases with decorative fabric or buckram shades for their table lamps. Wickerwork is employed for a wall bracket by Heal & Son, Ltd., whose extensive range of fittings includes an unusual table lamp with three lights set at different heights.

A rounded wedge-shaped wooden body with two metal legs provides a modernistic effect for table lamps by Oswald Hollman. Crinkled buckram is used for the shades of these fittings as well as for several neat designs of wall brackets and table standards made by the General Electric Co., Ltd. Special balancing and drawing board table lamps are shown by Merchant Adventurers, Ltd., who also have a display of semi-indirect floor and table standards. Cylindrical shades which give an equal proportion of upward and downward light are among an extensive range of wooden and metal floor and table units by Troughton & Young, Ltd. An example of a fully indirect table standard is provided by George Forrest & Son, Ltd.

Light metal rods have been employed in a variety of futuristic designs by Bernard Schottlander, while brass bars are the medium adopted for a floor standard by Finmer, Ltd., whose "Kip" lamp is equally suitable for wall or table. A wall unit by Cone Fittings is suspended by its flex with two metal legs to keep it in correct position in relation to the wall.

Engineering in Europe

Survey of Current Literature

FROM this author's outline of the principles of classification of electrical accidents on low-voltage systems, according to whether the dangerous voltage is applied across a human body only or the human body in series with other resistances, the two main possible circumstances appear to be a constant and a decreasing "body voltage," according to the way in which the accident is produced, particularly whether by single-pole or double-pole contact. Of great importance are the areas of entry of the current into the body (in other words, the current density) since the complex phenomena of the resistance of the human body and the physiological effects of the current have been established to depend mainly on current *density*.

Additional effects are the electrolytic disintegration of the protective layer of the skin, which reduces the body resistance within a very short time to a fraction of the initial value, which might be of the order of 100,000 ohms. A series of interesting experiments is also reported which were carried out at up to 500 V, obviously with series resistances high enough to render the tests harmless, confirming the difference between the effects of constant and decreasing "body voltages." The results of these tests are compared with those of other authors and discussed on the author's own theory.—"General Directions of Research into Electrocution by Alternating Currents of Commercial Frequency," M. Villain, *Revue Générale de l'Electricité*, Vol. 61, No. 8, pp. 351–355, August, 1952, in French.

Circuit Breaker Tests

The breaker tested is an improved model of the well-known Sprecher & Schuh orthojector type, consisting of three single-pole breakers which can be operated at will either as a mechanically coupled group, or individually by electric drive. The latter mode of operation is particularly suitable for single-pole rapid-reclosing on single-phase faults without loss of synchronism (possible only on short or medium-length lines). Although the remote control of the breaker is electromagnetic, the drive itself is by powerful springs; those for tripping the breaker are automatically tensioned during closing. Some 30 tests were carried out in "tripping–closing–tripping" cycles (at intervals of 0·3–0·45 sec) on short circuits and at over-voltages without any difficulty and the breaking capacity was established as 4,830 MVA at 416 kV, which corresponds almost to a short-circuit in phase opposition in a 220 kV system with directly earthed neutral. Also, idling lines of up to 830 km total length could be disconnected without difficulty. The condition of the circuit breaker, contacts and oil after testing was practically the same as before the tests.—"Tests on a New Orthojector-Type Circuit Breaker in the Fontenay Testing Station of Electricité de France," H. Ehrensperger, *A.S.E. Bulletin*, Vol. 43, No. 18, pp. 730–738, 6th September, 1952, in French.

Capacitor Manufacture

Metallized paper capacitors are a progressive development of the scroll type in operational characteristics as well as in convenience of the production process. Their history can be traced back to the beginning of this century when Mansbridge first tried to roll a mixture of zinc powder with a binding agent on to paper. It was then that the most valuable property of "self-sealing" after a puncture was discovered. However, the composition of these foils and particularly the low conductivity of the metal electrode and low insulation resistance of the paper dielectric prevented the introduction into practice of this type of capacitor. The subject was taken up again shortly before the second world war in Britain and Germany; zinc was replaced by aluminium for capacitors up to 0·1 μF for d.c., whereas for larger capacitances for a.c. the original zinc was retained. Both metals are now deposited on the paper by vacuum evaporation. The capacitor paper is treated with suitable

varnishes before the deposition of the electrodes, in order to close the pores of the paper, preventing the metal from penetrating into the paper and improving its dielectric properties. Single and multiple-layer types of capacitors are used for various purposes. The article gives all the relevant details of the production process and testing methods and reports test results.—" Metallized Paper Capacitors," H. Elsner, *A.S.E. Bulletin*, Vol. 43, No. 18, pp. 721–727, 6th September, 1952, in German.

German Switchgear

Various East German firms describe their new types, particularly oil-less, of intrinsically safe expansion breakers for ratings up to 200 MVA (suitable for compressed air operation) and truck-type breakers for use at the coal face, up to 80 MVA. Other firms present oil-poor turbulator types for remote automatic rapid-reclosing. There are, furthermore, overcurrent circuit breakers of the contactor type 500 V/100 A of 10 kA breaking capacity with magnetic telecontrol and master switches for operating contactors controlling heavy drives (rolling mills, cranes, etc.), limit switches and new types of camshaft switches and controllers, centrifugal starters and switches and three-phase contactors for 600 A. Apart from small intrinsically safe mining equipment of novel design, new types of ironclad switchgear on the turbulator principle, draw-out and stationary models, for single and double busbar operation and up to 400 MVA breaking capacity, are of interest. Particular attention has been paid to safety against contact voltages.—" New Switchgear Developments," *Deutsche Elektrotechnik*, Vol. 6, No. 9, pp. 436–444, September, 1952, in German.

Safety in Mining

This author first analyses the various dangers and their sources, e.g., purely electrical faults and operational events like heavy overloads and charging by capacitive currents, and then reviews systematically protective systems and apparatus with due regard, on the one hand, to their suitability for systems with earthed or isolated neutral and, on the other hand, to the regulations of various mining countries. Overcurrent and earth fault protection and protection against charging currents by balancing transformers and protective relays are discussed, with special consideration of British practice. The following sections deal with protection against contact voltages and arcing, transformer protection and specially protected mining cables. Direct and indirect telecontrol circuits are described (the latter with reference to the Reyrolle system), and supply systems for coal cutters, trailing cables and their protective are discussed. In the author's opinion the technically most advanced protective system at the time of writing is the ACEC (Belgian) system. The article concludes with an analysis of the British mining accident statistics for 1946 and 1949. —" Safety Devices for Electrical Mining Equipment," F. Cadil, *Elektrotechnicky Obzor*, Vol. 41, No. 8, pp. 348–356, August, 1952, in Czech.

Electro-Mechanical Transducer

A novel type of contact breaker is described, the mechanical-electrical transducing element of which is a piezo crystal used as a bending oscillator. By the particular design of the apparatus the contact space is perfectly screened against the exciting voltage of the crystal. This relay is suitable as the principal element of an amplifier circuit specially designed for a very high amplification of minute d.c. voltages supplied by sources of very high internal resistance and correspondingly low output. The method used consists in amplifying the d.c. input chopped up by the electro-mechanical transducer and rectifying it again. The accuracy of the measurement is such that the errors are of the same order as the voltage fluctuations of the Nyquist noise of the input resistances. Assuming a bandwidth of 1 c/s, and an input resistance of 100 megohms, powers as small as 5×10^{-20} W may be measured. This instrument will be particularly valuable for pH, X-ray intensity and other radiation measurements.—" A Highly Sensitive D.C. Amplifier of High Input Resistance," W. Kroebel, *Zeitschr. für Physik*, Vol. 133, No. 1/2, pp. 30–40 (1952), in German.

[Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates. —Editors, *Electrical Review*.]

A.S.E.E. Conference

The next annual conference of the Association of Supervising Electrical Engineers is to be held at the Hotel Metropole, Leeds, on 16th and 17th May.

VIEWS on the NEWS

By REFLECTOR

SOME unusual electrical applications are said to have been discovered by the Hydro-Electric Power Commission of Ontario in the course of changing over the Southern Ontario system from 25 to 60 c/s. One man was found to have a device by which his cat could let itself out. He had trained the animal to step on to a treadle which actuated a small motor-operated door. Another consumer arranged the door bell push so that his deaf wife could be made aware of callers. In this case a motor-driven fan was installed under the floor of each room to set up violent vibrations when the push was operated. Combined with this was a series of signal lamps.

* * *

The chief engineer and manager of the Electricity Department of one of the outposts of the Empire has sent me a letter which illustrates what people in his position have to cope with. Apparently a resident needed a supply of electricity and to plead his cause engaged an attorney. This functionary concluded his letter as follows:—

> "I have the embarrasmenity to instruct with some authonticated instruction cencerning the topic or same question, and to bewilder with such electric installation interuption and interception princepally in this colony, than the others counteries, and to supplicates from the responsibles the taking of the necessary proceedings for making arrangements and systems for the necessary facilities for securing or supplying applicants duly or within superficial period with their requirements as expediated by the Egency, and endingly I requests you as to have the consequence towards my client poriposition as hoping that he will secure his request are long to his precedence in waiting."

* * *

It has been agreed by the Yorkshire Electricity Consultative Council that consumers shall be provided with meter cards only when they ask for them. A proposal that all consumers should have them was rejected. Mr. A. Haselhurst, chief commercial officer of the Yorkshire Board, is reported to have said that to provide cards for the whole area would cost about £13,000. This sounds rather a lot but in fact it represents only about 2½d for each consumer—not too much for this useful service.

* * *

A correspondent tells me that the passing of the paraffin lamp in the Isle of Skye, with the introduction of electricity, is being recorded in music and drama. Col. John MacDonald, of Viewfield, Skye, has been inspired to compose a pipe tune, "MacDonald's Farewell to the Paraffin Lamp" and Roderick MacLean, of Portree, is writing a new play, "A Skyeman's First Electric Shock." All additions to the music and drama of electricity are welcome but I think that the play might have had a kinder title. The pipe tune can hardly be a lament.

* * *

A Leeds boy was taken to hospital suffering from a shock received while boarding a tramcar. His condition was not serious and he was allowed to go home after treatment. Cases of mild "static" shocks from buses are fairly frequent but this was a most unusual case. An explanation given to the *Yorkshire Post* was that sand on the rails provided slight insulation between the car and earth. I had not heard of such a case before.

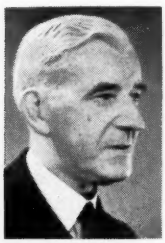
* * *

Blueprints are in the news again. Reporting on the proposed arrangements for Coronation celebrations at Aberdeen (in which, it is alleged, the "North-east Hydro-Electric Board" is participating), the local *Press and Journal* refers to "a blueprint sketched last night by the Processions Sub-Committee."

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Minister of Fuel and Power has announced appointments and reappointments of chairmen and deputy chairmen of the various Area Electricity Boards. The only new appointments are **Mr. J. Rankin,** O.B.E., F.C.I.S., Comp.I.E.E., secretary, Merseyside and North Wales Electricity Board, who succeeds Mr. D. P. Oliver, J.P., as deputy



Mr. J. Rankin

Mr. W. A. Gallon

chairman of the Merseyside and North Wales Electricity Board, and **Mr. W. A. Gallon,** B.Sc., M.I.E.E., controller, Merseyside and North Wales Division, B.E.A., who is appointed deputy chairman of the South Wales Board in succession to Mr. E. Jones.

After forty years in the electricity supply industry, **Mr. H. W. Smith,** Middlesbrough, power station superintendent at Horden and Ayresome power stations, retired at the end of last month and has been presented with a silver tray. Mr. Smith, who entered the electricity supply industry in 1911, became shift charge engineer with the Cleveland & Durham Power Co., Ltd. He served in a number of power stations on Tees-Side before taking charge at Horden and Ayresome.

During the recent floods at Penryn, in Central Cornwall, **Mr. E. Edmonds** (Central Cornwall district engineer, S.W. Electricity Board) and his staff played a valuable part in assisting the police, fire service and Corporation workmen in winning the struggle against a river which was blocked and overflowed its banks. Mr. Edmonds and his staff succeeded in keeping the water out of an underground 11 kV isolator which fed about 1,000 consumers and was at times only a few inches above the flood. They also provided floodlights to enable the work to go on at night and played a big part in the relief of the flooded St. Gluvias Road area by excavating a trench to drain off the water.

Mr. David Higgs, B.Sc., son of Mr. Walter Higgs, chairman of Higgs Motors, Ltd., has been appointed managing director of the company.

Mr. A. P. Ross has joined Thorn Electrical Industries, Ltd., and will be mainly concerned with the sale of special products and technical components. Mr. Ross was previously with Belling & Lee.

Mr. P. F. R. Ayles, overseas director of Plummer Bros. & Co. (England), Ltd., is at present in this country after a nine months tour of India and Pakistan. He is anxious to meet manufacturers situated in South-East England who are interested in developing their export sales in the Middle and Far East.

Mr. F. C. Barford, T.D., M.I.E.E., member of the Association of Mining Electrical and Mechanical Engineers, who was manager of the Newcastle-on-Tyne district office of the British Thomson-Houston Co., Ltd., has been appointed manager of the company's Manchester district office in succession to **Mr. A. B. Race,** who is retiring after twenty-two years in that position. Mr. Barford received his early general education at the Lawrence Sheriff School, Rugby, and then served an engineering student apprenticeship with the B.T.H., and attended the Rugby College of Technology and Arts. After a time in the Industrial Sales Department, Rugby, he was posted to the power engineering staff of Glasgow district office.

Mr. F. C. Barford

Shortly after being commissioned in the R.A.O.C. he was called to the Colours in 1939, being transferred to R.E.M.E. on its formation in 1942. Promoted Lt.-Colonel in 1943, Mr. Barford held the position of Commander R.E.M.E., and also assistant director of mechanical engineering in anti-aircraft forma-

tions in this country. On his release from the Forces in 1945, he rejoined the B.T.H. on the power engineering staff of Manchester district office. The following year he went to Newcastle district office as deputy manager, and in 1947 was appointed manager. As already announced, **Mr. S. J. Clarke** succeeds Mr. Barford at Newcastle.

Mr. T. Stockwell, M.I.E.E., has been appointed generation engineer (operation) of the No. 2 Sub-Division, North Western Division, B.E.A.; he succeeds Mr. P. Ridings who recently retired.

Mr. T. Stockwell

Mr. Stockwell received his early training with Richardsons, Westgarth & Co. and the British Thomson-Houston Co., Ltd. He commenced his career with the Electricity Department of the Rawtenstall Corporation as a shift charge engineer, eventually becoming borough electrical engineer. On vesting date he was appointed executive officer for the B.E.A. at Bacup and Rawtenstall and in August, 1948, he was appointed senior assistant engineer (electrical) in the No. 2 Sub-Division.

An informal luncheon was given at the Waldorf Hotel, London, on 16th December, in honour of two retiring branch managers of British Insulated Callender's Cables, Ltd.—**Mr. R. S. Gough**, Bristol, and **Mr. T. R. Thomas**, Cardiff. During the lunch Mr. H. J. Stone, director and deputy chief executive of B.I.C.C., presented each of them with a cheque which had been subscribed to by their many colleagues in the company.

Mr. Gough, who has been branch manager at Bristol since the formation of B.I.C.C. in 1945, was articled to R. Alger & Sons, Newport, immediately on leaving school. On completion of this training he joined the Construction Department of the Yorkshire Electric Power Co., and among the many contracts with which he was closely associated was the interconnecting of that company's electrical system with the systems of Bradford and Sheffield. In 1923 he was appointed resident engineer at the Bristol branch of the General Electric Co., Ltd., and thirteen years later he joined the former British Insulated Cables, Ltd., as sub-branch manager at Bristol.

Mr. Thomas received his practical training in the Electrical Department of D. Davis & Sons, Ltd. (colliery proprietors), and was eventually appointed assistant electrical engineer. In 1919 he became chief electrical engineer to the Main Colliery Co., Ltd., Glamorgan, and four years later joined the former British Insulated Cables, Ltd., as a technical assistant at the Cardiff office. He was appointed branch manager in 1936. Mr. Thomas is a Fellow of the Association of Mining Electrical and Mechanical Engineers and was president of the South Wales Branch in 1945.

At a meeting of the South Eastern Electricity Consultative Council on 18th December a resolution was passed thanking **Mr. M. A. Bulloch**, A.M.I.E.E., for his services as chairman of the Council for the past four years and wishing him better health and many years of happy retirement.

Before a large audience in the main hall of their canteen at Treforest, **Simmonds Aerocessories, Ltd.**, held their annual presentation of long service awards to employees on 11th December. The presentations were made by the joint managing director, Mr. L. G. Oxford, who was supported on the platform by Mr. E. S. Mead, sales director, Mr. G. E. Bache, general manager, and a number of senior officials. Each long service employee received a badge and a monetary award. Entertainment was provided by Simmonds' employees compered by Mr. Islwyn Hughes.

The annual dinner of **British Electric Lamps, Ltd.**, Wimbledon, was held on 18th

Mr. H. J. Stone, director and deputy chief executive of B.I.C.C., presenting cheques to Mr. R. S. Gough (left) and Mr. T. R. Thomas (right), two retiring branch managers

December at the Wimbledon Hill Hotel, when 200 employees and their friends enjoyed Christmas fare. The toast of the company was proposed by the works manager (Mr. G. H. C. Angold), and Mr. E. W. Grote (managing director) replied. Mr. Grote was accompanied by his wife, and his sister, who is a director of the company.

Mr. H. Green, shift engineer at the Stoke-on-Trent power station, has been appointed engineer-in-charge of the Kingston-on-Thames power station.

In our last week's issue we reported the appointments of **Mr. D. C. Thomson,** M.A.(Edin.), B.A.(Hons.) (Oxford), as director of welfare of the British Electricity Authority, and **Mr. W. Casson,** M.I.E.E., as system design and development engineer in

Mr. D. C. Thomson

Mr. W. Casson

the Transmission Design Branch at the headquarters of the B.E.A. We now reproduce their portraits.

Mr. F. Carleton Anderson, a founder-director of the Harland Engineering Co., Ltd., retired on 1st January and **Messrs. W. Scott** and **L. Spiro,** long-service members of the staff, have been appointed to the board of the company.

Mr. S. F. Steward, C.B.E., chairman of the **South Western Electricity Board,** officially opened the Plymouth Social and Benevolent Club's new premises on 18th December. After an introduction by Mr. N. Axford, the Board's district manager in Plymouth, Mr. Steward said the Club's membership of over 800 was drawn from all branches of Divisional (B.E.A.) and Board employees. During the evening Mr. Steward presented trophies for billiards and snooker.

On 10th December the annual presentation of gold wrist watches and long service certificates to those who have served forty years with **Ferranti, Ltd.,** took place. Forty-three presentations were made and Sir Vincent de Ferranti, chairman and managing director, conversed with the recipients during a meal provided after the presentation.

His Excellency Dr. Subandrio, Ambassador of Indonesia. went over the works of

Indonesian Ambassador at Ferranti works

Ferranti, Ltd., on the occasion of a recent visit to Manchester as a guest of the Manchester Chamber of Commerce.

The photograph shows Dr. Subandrio, centre, with his Press attaché, Mr. Sudjoka, right, being conducted through the Avenue Works by Mr. J. E. L. Robinson, manager of the Transformer Department.

Sir Ernest Canning has relinquished the position of joint managing director of W. Canning & Co., Ltd., but is continuing as chairman. **Mr. G. A. Pope,** joint managing director, has also become deputy chairman, and **Mr. F. H. Ewens,** financial director, has been appointed joint managing director. **Messrs. E. G. Catton, H. C. Clements, G. G. Dawson** and **E. L. Masek** have been appointed to the board.

Mr. W. F. Litherland, Bristol office manager with Standard Telephones & Cables, Ltd., has joined Denman Electrical Supplies, Ltd., Bristol, as a director. Mr. Litherland commenced his career in 1923 with Ward & Goldstone, Ltd., Manchester, and went to W. E. Beardsall & Co., Ltd., in 1927. Five years later he joined Standard Telephones & Cables as Northern representative, eventually becoming sales promotion manager of the Brimar Valve Division. He became Bristol manager in 1940.

Mr. W. F. Litherland

About 400 children of employees of the **Electric Construction Co., Ltd.,** were the guests of the Works Institute at a Christmas party held in the works canteen on 20th December. There were two sittings for tea, and an excellent entertainment was arranged.

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Sir **John Wardlaw-Milne** has left the board of Cable & Wireless (Holdings), Ltd., and has been appointed hon. vice-president.

Mr. E. W. Wale, secretary of the Cable Makers' Association, who was injured in the Harrow railway disaster, is making a rapid recovery at Edgware General Hospital. After a number of operations Mr. Wale expects his injured foot to be in plaster next week, and soon after that he will be able to leave the hospital. He expresses his thanks for the numerous letters and inquiries he has received while in hospital.

At the annual dance and Christmas party of **W. J. Furse & Co., Ltd.,** Nottingham, on 19th December, cheques were presented by Mr. W. F. Furse, M.I.E.E., chairman, to Mr. J. F. Cowlishaw (counting house department), and Mr. G. Auworth (works department), both of whom have completed fifty years with the firm.

We learn with pleasure that **Mr. H. Nimmo,** chairman of the Southern Electricity Board, who has been seriously ill in a London hospital, has now left for his home in Essex for a period of convalescence.

The future of industry and of the country depended upon a continual flow into industry of a fair proportion of the ablest young people, said **Mr. J. A. Crabtree,** works director of J. A. Crabtree & Co., Ltd., at the fourth annual dinner of the company at the George Hotel, Walsall, on Saturday, when gold watches were presented to seventeen employees who had completed twenty-five years' service with the company.

The foremen of **E. K. Cole, Ltd.,** held their annual dinner at the London Hotel, Southend-on-Sea, on 12th December. Mr. E. K. Cole, chairman of the company, Mr. N. C. Robertson, deputy managing director and other directors attended as guests. After the dinner Mr. Cole presented gold watches to Mr. J. Baxendale, foreman in the Service Department, Mr. S. G. Lee, chief clerk, Transport and Despatch Department and Mr. T. W. Dudley, foreman in the Radio Division, all of whom have recently completed twenty-five years' service with the company.

Tickets are still available for the dinner-dance which is being held by the Utilization Section of the **Institution of Electrical Engineers** at the Criterion Restaurant, Piccadilly, W.1, on 13th January. Application for tickets should be made to the secretary of the Institution, Savoy Place, London, W.C.2.

The annual general meeting of the Northern Counties Area of the **Electrical Industries Benevolent Association** will be held on 15th January, at 3 p.m., in the Lecture Theatre, Lower Ground Floor, Carliol House (Pilgrim Street entrance), Newcastle-upon-Tyne, under the chairmanship of Mr. J. C. Arkless.

OBITUARY

Mr. W. T. Gibson.—The death occurred on 27th December, at the age of fifty-three, of Mr. William Thomas Gibson, O.B.E., M.A., B.Sc., M.I.E.E., chief valve engineer of Standard Telephones & Cables, Ltd.

E. A. Uttley.—The death occurred at Bognor Regis on 27th December, of Mr. Edwin A. Uttley, M.I.Mech.E., M.I.E.E., late of the Rhodesian Government.

WILLS

Lt.-Col. the Hon. Sir James Cecil Mussen Campbell, K.B.E., C.M.G., formerly managing director of the Marconi Radio Telegraph Co. of Egypt, who died on 11th May, left estate in England valued at £12,416.

Mr. W. Smith, A.M.I.S.E., A.I.E.E., section head (construction) in the Northern sub-area of the London Electricity Board, who died on 11th September, left £4,676 gross (£4,622 net).

Mr. A. J. Bagley, showroom manager of S. Smith & Sons (England), Ltd., who died on 5th July last, left £6,075 gross (£5,120 net).

Mr. J. O. Hadwin, electrical engineer, of R. Hadwin & Son, who died on 26th May, left £15,160 gross (£15,110 net).

Australian Statistics

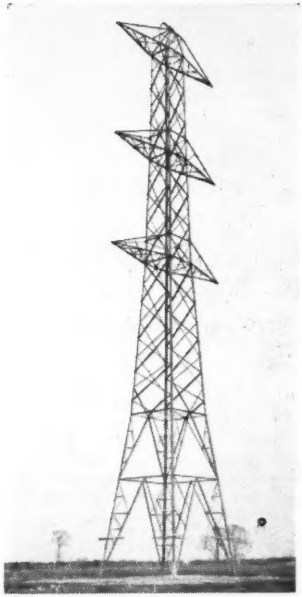
LATEST official statistics from Canberra, dealing with the financial year ended 30th June, 1951, show that at that date there were 354 electric light and power works in Australia (113 in Western Australia, 90 in New South Wales, 69 in Victoria, 45 in Queensland, 34 in South Australia and 3 in Tasmania) compared with 395 in 1939. Employees numbered 9,990 (compared with 6,489) and salaries and wages paid during the year amounted to £6,680,000.

The value of materials used was £2,712,000, and the value of fuel, etc., was £21,259,000 and output was valued at £38,493,000. The value of land and buildings was £16,931,621, and of plant and machinery £53,441,192, additions during the year totalling respectively £4,312,330 and £12,695,894. The average salary and wage paid per employee was £674; value of output per person engaged, £3,853; and average value of production per person, £1,454.

Electricity sold or used outside the generating stations totalled 8,946·3 million kWh (5,282·3 million sold by Government Departments, 2,181·6 million by local authorities, and 1,482·5 million by companies). The total quantity of electricity generated in electric light and power works was 10,029·8 million kWh and in other works 473·5 million, making 10,503·3 million kWh altogether.

The 275 kV Grid

First Tower Erected at Tilbury



THE first tower of the portion of the new grid that has been designed for operation at 275 kV at its inception and at 380 kV at a later date when loading conditions so require has now been erected near Tilbury. It forms one of 217 towers in a 45 mile section to run between Tilbury and Elstree, which will carry a double-circuit line of twin (" bundled ") steel-cored aluminium conductors having a copper-equivalent section of 0·4 sq in. For the higher voltage a new design of insulators and more of them to a string will be needed.

High-tensile steel has been used in the construction of the main legs (6 by 6 by ⅜in) and the chief bracings, which form 60 per cent of the total weight, mild steel being used for the remainder. The foundations necessitated a 10ft 6in ground excavation, work on which was started in September, and the base measures 26 by 25ft. The tower under mention is of the normal straight-line type, 136·5ft high and with a spacing of 37·5ft at the middle cross-arm. Its weight is 11 tons.

The steel-cored aluminium conductors are made up of 54/0·125 aluminium over 7/0·125 steel and the normal span length is 1,200ft. The twin conductors in each phase are spaced 16in apart in horizontal formation.

The order for the towers was placed by the British Electricity Authority (chief engineer, Mr. J. V. Pask) for the Eastern Division (controller, Mr. W. N. C. Clinch). The J. L. Eve Construction Co., Ltd., are the main contractors for the line. Blaw-Knox, Ltd., are responsible for the design of the towers and Painter Bros., Ltd., for their fabrication.

Naval Gas Turbines

Larger Units Manufactured

ON 14th July, 1947, the first ship in the world to be propelled by a gas turbine, motor gun boat M.G.B.2009 of the Royal Navy, put to sea. The gas turbine, known as the " Gatric " and rated at 2,500 s.h.p., was designed and manufactured by the Metropolitan-Vickers Electrical Co., Ltd. It was of the open cycle type without heat exchanger and consisted of a gas generator, based upon the F2 jet engine, and a separate power turbine.

Following the successful operation of this set at sea an order was placed with the Metropolitan-Vickers Co. for four larger gas turbines, known as the G2, employing the same cycle ; the gas generator is, with certain modifications, that of the Beryl jet engine.

The G2 units were originally designed to develop 4,800 s.h.p., but pending operational experience at sea the maximum power has been declared at 4,500 s.h.p. with a maximum continuous rating of 4,000 s.h.p. As in the original case the gas turbines are used only at high speeds and are designed for a total life of 1,000 hours, of which 300 may be run at maximum power. Diesel engines provide the necessary power for cruising and manœuvring.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Decentralization

WITH reference to the leading article in your issue of 12th December on "Decentralization," I think the following extract from David E. Lilienthal's book on the Tennessee Valley Authority is significant.

> "Diversity will always be the mark of decentralized administration, just as surely as uniformity (often for its own sake) is the mark of central and remote control."

Taking that point a little further a definition of decentralization might well be "freedom at the periphery." It would follow then that uniformity and decentralization are incompatible.

The answer, therefore, to your question "Is there any practical solution?" is "Yes, provided this incompatibility is faced squarely." The problem can then be approached by assessing the price in uniformity that can be paid for decentralization.

In working out the details and checks to see that the price is not exceeded, time and skill will be required and the people at the top will require great courage to remodel their ideas about planning, national agreements and high-level decisions. Once, however, the problem is realistically faced that decentralization can only be achieved by sacrificing a measure of uniformity, a solution will be forthcoming as experience is gained in determining where diversity can be allowed. The disappointment over past efforts has been due to the fact that we have been trying to square decentralization with uniformity which, by implication, is as impossible as squaring the circle.

Croydon. G. H. FOWLER.

Outlet Heights

I LIKE the design of Col. Crompton's 1895 electric radiator illustrated in your 12th December issue. It has both dignity and charm, although the feet are perhaps a shade too ornate.

The really interesting thing about the picture, however, is that the radiator is fed from a socket about 2ft 6in high. The dignified Victorian who owned this dignified radiator could therefore plug it in in a dignified way. How much better than the floor grovelling to which our skirting height sockets condemn us to-day.

I think we have made a mistake in putting our sockets so near the floor. For the not so young or the not so agile they are a nuisance. About 18in is a better height. It is high enough to reach without stooping unduly and low enough to ensure that the flexible cable will still lie, for the most part, on the floor.

*London, S.E.*1. FORBES JACKSON.

Gas *versus* Electric Cooking

"FREUDIAN" appears to have a low opinion of the average housewife in implying that she cannot be bothered to learn a new technique. I wonder how she ever came to tear herself away from cooking with open fires and hot stoves! Being blessed with an intelligent wife I installed electric cooking when we married, despite the "Mother's stove," and would not change now.

The physical processes of cooking are doubtless equally effectively carried out by gas or electricity, provided the respective cookers are properly used, but I think that one of the big advantages of electricity is the absence of the large volumes of grease-laden products of combustion which must come from the burning of gas, which give a pervading odour and deposit their grease on the walls of the room. The time saved by this greater cleanliness would easily repay any spent "in getting used to a new way of cooking," to quote "Freudian."

As regards cost, neighbours have gas for cooking, we use electricity for nearly everything, and our total fuel bill for a larger house (but same size family) is lower.

A note on reliability might also be added. During the 1947 cuts we came to our neighbour's aid once or twice when gas pressures were low, but did not ourselves

require external aid, although I must admit in fairness that this may have been just our good luck.

I would add also a comment in respect of Mr. Scott's letter. I do agree that the rapidity of response is a very valuable feature in the gas boiling ring, but the ability to obtain an exact setting is also available in electric boiling plates by the use of the "Simmerstat" switch or other such device.

J. A. WALTERS.

Electric Clocks

I FULLY endorse the opinion of Mr. B. S. T. Wallace (*Electrical Review*, 28th November) that the most reliable electric clocks are those which are of the battery operated, spring wound type. I have had two of these clocks in use (entirely British made) for the past six years. With the exception of some early trouble (due, the makers tell me, to faulty lubrication) they have kept time with a remarkable degree of accuracy; the only service is replacing the $4\frac{1}{2}$ V battery every twelve months.

The price of the clocks is, however, too high to give them a wide appeal to the general public. If the makers could arrange to manufacture on the scale mentioned by your correspondent the price would obviously be considerably reduced and the sales might reach astronomical figures. Imagine the possibilities where there are different frequencies and voltages and in those large areas of the world which are without electricity supply.

Llandudno. D. MANGUE.

I READ in your journal of 28th November (my husband's copy) the letter from Mr. B. S. T. Wallace and should like to say how much a housewife appreciates having clocks without wires trailing all over the place and also clocks which keep time. Formerly every time the vacuum cleaner was used in a room the electric clock (due to changing plug) stopped and it was usually forgotten to restore it.

Three years ago we had a mantelpiece battery clock given to us and since then we have bought two more. We were unable to find any of these in the London stores and in the end had to write to the friend who had made the present to us to ask him where he had bought the clock.

These clocks should be on sale in every town in the country without delay. The nameplate on our clocks clearly states "British made," so why the difficulty in obtaining such a very useful article?

(MRS.) K. R. MITCHELL.

Mayfield, Sussex.

RADIO IN THE WEST

A PERMANENT transmitting station at Fremington, between Barnstaple and Bideford, has taken over the West of England Home Service on 285 metres from the temporary transmitter which has been operating from a caravan on the site. This is one of a number of low-power stations being built by the B.B.C. to improve reception of the Home Service in certain areas. The equipment is designed for completely automatic operation without the attendance of staff. It comprises two Marconi transmitter units working in parallel to give an output of $1\frac{1}{2}$ kW. Later a third transmitter unit will be added, increasing the total power to 2 kW. The outputs of these units are paralleled by means of a specially designed r.f. hybrid-coil combining circuit which is arranged to prevent any interaction between them, and their combined output is fed to a T aerial supported by two tubular steel masts each 126ft high. Main and reserve crystal controlled drives are provided, and automatic frequency control equipment will shortly be installed which, using the Droitwich 200 kc/s carrier as a reference, will maintain the transmitter drive frequency within very close limits of accuracy. The incoming programme is checked by an automatic line monitor designed and developed by B.B.C. engineers. A power supply is taken from the South Western Electricity Board's 415 V, 3-phase, 50 c/s network and an automatic voltage regulator is provided to maintain the supply voltage to the transmitters and other equipment constant despite variations in the incoming supply voltage.

In order to improve reception of the Home Service in the vicinity of Redruth, Cornwall, the B.B.C. proposes to add a third transmitter to its present station at Redruth, which already broadcasts the Light and Third Programmes. The new transmitter will be of 2 kW power and will share the 206 m wavelength.

On 20th December the Wenvoe television station in South Wales, which has been operating on medium power since 15th August, began transmitting at full power.

ELECTRICAL MATERIALS

Survey of the Position in 1952

IN the following article the Metal Information Bureau, Ltd., provides the customary review of the factors affecting during the past year the supply of some of the principal materials used in the electrical industry.

COPPER:—During 1952 the Government remained the sole buyer and seller of copper so far as users in this country were concerned, so that in this respect the year showed no change from the method employed since the beginning of the last war. The Ministry of Materials, the responsible Department, also continued to fix prices according to its acquisition and other costs; the figure at which it sold to consumers increased steadily. The price stood at £227 a ton, delivered, at 1st January, 1952. On 1st April it was increased to £231 a ton; on 15th June to £281; and on 5th July to £287. On 1st August the price was reduced to £285 a ton.

The big increase around the middle of the year resulted from the abrogation of the Chilean agreement with America, the immediate effect of which was for Chilean copper to be advanced by 6 cents to 27½ cents per lb; since the British Government's arrangements with its Commonwealth suppliers called for a buying price based on a regularly quoted American price the above increase was followed by a similar adjustment in the United Kingdom. Furthermore, the sale of 20 per cent of Chilean output on the world market at substantially higher figures (35½ cents per lb f.a.s.) led to a further aggravation of the copper pricing problem, particularly since United States domestic copper producers had a ceiling of 24½ cents placed on their output.

This generally confused situation resulted in the British Government making a direct arrangement with its Empire suppliers on the basis of 33½ cents per lb (£268 a ton); after allowing for various handling, insurance, interest and delivery charges the cost to the consumer here is £285 a ton.

The use of copper in Britain, as indeed in most important industrial countries, was limited throughout 1952 by allocations being made through the International Materials Conference on a quarterly basis and, in Great Britain and America at any rate, by Government quotas being fixed for consumers. In this country acquisition was subject to licence. In general, the supply position remained tight, although the close of 1952 saw some improvement; this was reflected in the scrap supply position, scrap values showing a decline as the year neared its end.

During the first ten months of the year United Kingdom consumption was 489,958 long tons, against 460,627 tons in January–October, 1951. Of this 180,099 tons represented high conductivity products.

Not only was copper under allocation during the whole year but the use of the metal in a wide range of products was either banned or restricted: as a result of the improved supply outlook, however, the Government has decided that restrictions may now be lifted. In conclusion it may be said that various plans, notably in the United States and Rhodesia, point to a steadily increasing output of copper; new mines, recovery from lower grade ores, and increased smelter and refinery production loom large in company development schemes.

TIN:—The past year witnessed wide fluctuations in the price of tin but in the main its value seems to have been very reasonably upheld, although producing quarters maintain that at around £950 a ton it is by no means over-priced having regard to current costs of production. Tin mining is being carried on in the Far East under great difficulties; on account of terrorist activity prospecting for new mining areas has been rendered practically impossible—a natural corollary has been the necessity to work ground of lower and lower grades. Present official policy in Malaya is having a beneficial effect although some time must pass before conditions return to normal.

In the early part of the year the British Government concluded an agreement

with the United States under which the latter was to be supplied with 20,000 tons of tin during 1952 at a base price of 118 cents per lb f.o.b. (£944 a ton); the U.S. Government also concluded similar contracts with the Indonesians and Belgians. Thus the British Government was regularly in the market for tin during the greater part of the year and this, of course, was an important consideration in the tin price picture.

The Bolivians, who in the past have supplied the United States with large quantities of low-grade ore for use in the Texas City smelter, found themselves unable to obtain satisfaction in their claims for a higher price. The nationalization of the Bolivian mines on 31st October raised problems regarding future marketing and it remains to be seen, particularly since a large amount of American capital is tied up in the mines, what will happen in connection with compensation and future ore sales. Britain, too, is concerned in this matter.

Although the United States, the world's largest consumer of tin, returned the import of the metal to private hands during the course of 1952, end-use controls remained in force in that country, while the Reconstruction Finance Corporation, previously the sole buyer and distributor, still continued "in the business," all along being a seller to consumers at 121½ cents per lb (£972 a ton). Thus an effective brake was provided against sharply rising world prices.

Consumption of tin in the United Kingdom during the first ten months of 1952 totalled 18,894 tons, compared with 20,153 tons in the corresponding period of 1951.

ZINC:—In zinc, also, 1952 witnessed a steadily improving supply position; indeed, the weight of available metal made for a top-heavy situation. In Britain the Government remained the sole buyer and seller and continued throughout the year to fix the price to consumers; at the beginning of the year zinc stood at £190 a ton but by the end had been lowered progressively, with one or two minor upward revisions, to £110 a ton.

The use of zinc in the manufacture of a wide range of articles had previously been banned or restricted but by September the improved supply position led to these restrictions being lifted and zinc is now freely usable. It was decided that the London Metal Exchange should be reopened for this commodity on 2nd January, 1953, and steps have accordingly been taken to bring in a new contract for dealings on the market. As with lead, the Government held large stocks, the disposal of which provided an even bigger problem: a certain portion of these holdings are to be disposed of to producers (each producer re-purchasing its own brands) but the Government will still continue to hold an appreciable tonnage, much of which, it is hoped, will be absorbed into a national "stockpile." There appears to be little doubt, however, that the supply of zinc will be adequate and it is generally expected that prices will be reduced when free dealing recommences.

Zinc consumption in the United Kingdom during the first ten months of 1952 was 217,778 long tons against 234,635 tons in the corresponding period of 1951.

LEAD:—The outstanding item of interest in lead during 1952 was the fact that free dealings were resumed on 1st October. A new contract was drawn up under which dealings are carried on in a minimum of 25 tons in lead of a guaranteed purity of minimum 99·97 per cent; brands dealt in on the Exchange have to be approved and registered.

After a position of tight supply in 1951 more lead became available as 1952 progressed. Whereas the Government's selling price on 30th September stood at £131 a ton (delivered), initial dealings on the Exchange the next day quickly reduced the price to around £80 a ton (ex wharf); recovery to around £95 a ton has since occurred. The substantial stocks of lead held by the Government when free trading commenced were naturally a source of concern to operators despite the fact that the official attitude was to leave the market to find its own level; this situation was later cleared by the Government reselling to producers their own brands and holding an appreciable quantity of lead in reserve, leaving only a small tonnage to be sold by the Government broker as and when required by the market.

During the year the British Government sold to the United States appreciable quantities of lead (mainly from its holdings abroad) from which much-needed dollars were earned.

The reopening of the London market had repercussions elsewhere, notably in the United States, where the sharp marking down in prices incurred the disapproval of producers. The duty on lead imported into America had earlier been restored but even so it was found that foreign lead could be landed at figures below those quoted by the domestic producers. The effects of this have not yet been fully overcome and there is a movement afoot across the Atlantic to introduce a sliding-scale duty to take account of rises and falls in lead quotations.

In the United Kingdom the demand for lead products during 1952 showed some falling away and the demand for the raw metal was at times poor; however, the closing months of the year witnessed some improvement although demand cannot still be called particularly impressive.

United Kingdom consumption in January-October, 1952, was 242,268 long tons (against 289,872 tons) of which cable making accounted for 88,400 tons (75,840 tons) and the battery industry for 22,133 tons (29,069 tons).

ALUMINIUM:—The ground gained aluminium and its alloys at the expense by of other metals during the year 1951 was lost during 1952. Improved supplies of these other metals was a contributory factor but they also weakened in price against a steady increase in the cost of the light metal which had a more direct effect upon the use of aluminium in a variety of fields. Rather greater quantities were made available as the year progressed and this is underlined by the eventual removal of control from scrap and secondary metal, large quantities of which are used for various purposes.

The bulk of United Kingdom requirements continued to be met from Canada and long-term contracts ensure that substantial tonnages will be available to United Kingdom fabricators for a number of years. Efforts are being made, however, to bring into being a sterling area source of virgin aluminium supply—since home productive capacity is limited by power considerations—and there now seems to be every possibility that a centre of production (with an ultimate annual capacity in excess of 200,000 tons) will rise in the Gold Coast, West Africa, where raw material and power are available.

Meanwhile, vast schemes for increasing aluminium production are afoot in various countries, notably the United States and Canada, where substantial sums are being expended to ensure in the near future an adequate supply of the metal for both military and industrial requirements.

IRON and STEEL:—In the first ten months of last year the United Kingdom was actually a net importer of iron and steel. (Total imports were 2,045,041 tons compared with exports amounting to 2,036,788 tons.) This was the result of measures taken some time ago to meet the demands of the rearmament programme and very active "civilian" consumption at a period when British steel output had been reduced by raw material shortages.

Now, however, the steel industry is beginning to feel the benefits of the first post-war development plan. This plan provided for more blast furnaces so that steel production could be based on pig iron rather than on scrap, and several large new and several modernized blast furnaces went into service last year. With more pig iron, and supported by a vigorous home scrap drive, steel production recovered from its curtailment in 1951 and in November actually reached the record annual rate of nearly 18,000,000 tons.

Yet rising production and heavy imports have not freed all consumers from shortage of steel and many vital industries continue to go short. Even the shipbuilding industry, with orders in hand to last for years, has been unable to get all the steel it is entitled to under recently increased quotas. However, with further imports in 1953 together with a high rate of domestic production, the situation is expected to improve rapidly.

RUBBER:—While there were some fluctuations in rubber prices last year these were in nothing like the same degree as in 1950 and 1951; in general values showed a steady decline from around 40d to 25d per lb for ribbed smoked sheet. As in the past, the United States, the world's largest consumer, was the dominant factor and, with the completion of "stockpile" purchases and renewal of large-scale synthetic rubber production, was responsible for the steady decline in values. The cessation of "stockpile" buying and increased use of synthetic rubber forced a number of the smaller producers in the East to curtail output, although there

were signs of a re-entry of some American product manufacturers towards the close of the year and this has had the effect of bolstering production. The renewed buying by the United States has also made for a more stable rubber price position.

Throughout the year Russia has also been in the market but has been supplied only with rationed quantities: during the first few months of 1952 shipments to Russia rose sharply but these were in fact purchases entered into under earlier quota contracts. Rather more interest has, however, been shown by China and that country is attempting to enter into a rubber-rice agreement with Ceylon.

At the present time world output of natural rubber is running at around 150,000 tons monthly, with synthetic production about 66,000 tons; respective consumption figures are 113,000 tons and 67,000 tons a month.

Large Electrolytic Tinning Plant

WHAT is claimed to be one of the world's fastest vertical-acid type electrolytic line, capable of tinning enough steel every second to make 50 average-size tin cans, has begun operation at the Fontana, California, factory of the Kaiser Steel Corporation.

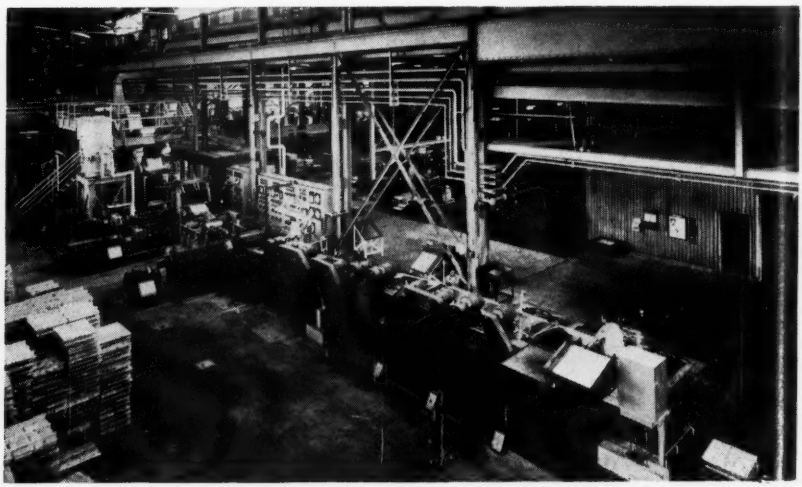
Rated at 1,200ft a minute, the new line will produce more than ten 2ft long sheets of tinned steel a second. The entire process is automatic, including the uncoiling, cleaning, pickling, plating, reflowing, oiling, shearing, classifying and piling of the tin-coated steel strip.

The General Electric Company of America supplied the complete electrical installation and furnished a photo-electric loop control system for the strip-propelling phase of the operation and other controls.

Two control panels, each over 90ft long, are used to regulate the a.c. and d.c. sections of the tinning line. Two 1,500 kVA transformers furnish the power for the flow-brightening equipment. A 60 kV unit provides the electrostatic charge for oiling the strip after it has been tinned.

The installation employs a beta-ray noncontacting gauge for continuously and automatically monitoring the thickness of the tin plate as it passes through the line. A pinhole detector checks the strip for perforations and other imperfections, while an improvement of the sheet classifier permits different flights of the classifier to be shut down and jogged to clear up a cobble and then reaccelerated without shutting down the line. This greatly reduces the amount of plate damaged when the line has to be stopped.

View from the drive side of the delivery end of the electrolytic steel tinning line, with main control boards in background, in the Kaiser factory at Fontana, California



Electrical Equipment for Canada

The B.S.I. / C.S.A. Approvals Service

THE Canadian dollar is hard currency, and this is among the very good reasons why Government and industry have combined to stimulate the greatest possible volume of British exports to the Dominion. A considerable increase in trade has in fact resulted.

Difficulties in the way of trade with Canada are, however, encountered by manufacturers of electrical equipment and of machinery which has electrical components. One problem which existed was the necessity for electrical equipment to comply with widely different regulations laid down by each Province. Eventually all these requirements were embodied in the Canadian Electrical Code. The Canadian Standards Association undertook to examine and test equipment for compliance with the Code and all inspection authorities throughout Canada have agreed to accept C.S.A. approved equipment. Most of the Provinces have gone further in enacting legislation making it an offence to offer for sale or install any equipment which has not been approved by the C.S.A.

New Organization Established

Even this "short cut" commonly involved British manufacturers in lengthy negotiations with the C.S.A. Approvals Laboratories and in considerable cost, to the extent that although Canadian buyers were ready to place orders, some British firms found it impossible to transact the business on a satisfactory and economic basis. It was against this background, and following the visit of a mission to Canada, that the British Standards Institution agreed to function as the agent of the Approvals Laboratories Division of the Canadian Standards Association, and to set up an organization through which British manufacturers could obtain C.S.A. approval in this country, and without having to send sample equipment to Canada for the necessary examination and tests. The scheme was reported by us at the time.

Since January, 1950, when the B.S.I./C.S.A. Approvals Agency was established, help in interpreting C.S.A. procedure and technical requirements has been given to more than 2,000 manufacturers, either by discussions in London or by the Agency's engineers visiting manufacturers' works. The range of products covered has been very wide—from domestic appliances to heavy equipment. The Agency has also dealt with potential exports to Canada of electrically-driven industrial plant such as machine tools, textile machinery, hydro-extractors and printing presses, and with specialized equipment for X-ray, dental and other medical purposes.

Applications Dealt With

Not all of these consultations have led to the granting of C.S.A. approval, because it was found that approval was inappropriate or unnecessary for many of the items discussed. Some 450 formal applications have, however, been handled, and after the necessary inspection and tests, 300 approvals have been granted and confirmed in Toronto while work on 40 other applications has been completed and now only awaits clearance in Canada. While some of these applications have dealt with, say, single appliances, the majority have included complete ranges of equipment, much of it in the heavier categories.

It has been found that many people and firms whose products are subject to this C.S.A. approvals procedure are unaware that it requires special knowledge and experience and that considerable training is necessary before engineers become proficient in accurately interpreting both the intentions and the written requirements of the Canadian Electrical Code. The Approvals Agency has had to acquire much of this knowledge as it has gone along, but it now has a large enough staff of fully-trained engineers to give manufacturers a speedy and efficient service.

In addition to its advisory function, and the testing of actual equipment, this staff has also undertaken the duties of factory re-inspection, as required under C.S.A. procedure to ensure continuity of approval.

Apart from their primary purpose, these re-inspection visits by Agency engineers have had the useful additional effects of enabling some manufacturers to extend their ranges of approved products and to secure authorization for minor changes in types of goods which were already approved.

Progress can be seen in another important direction. When the Agency started, it was unable to carry out all the work required on the applications received, and many of the smaller items of equipment concerned were therefore sent to the C.S.A. Approvals Laboratories in Toronto for examination and test. As staff and experience have grown and the number of uncleared applications has shrunk, the amount of equipment referred to Canada has progressively decreased.

To-day direct help from Canada is sought in only a negligible proportion of cases, and it is expected that in the near future all test work will be carried out by the Agency in this country, with corresponding acceleration in the whole approvals process.

Much of the success of the Approvals Agency in ensuring that British-made equipment satisfies the requirements of the Canadian Electrical Code has resulted from the close personal contact and ready co-operation between the officials and staffs of the B.S.I. and C.S.A. During the past year the director and chief engineer of the C.S.A. Approvals Division have been in Europe and have spent some time with the Agency's staff. Six months ago, when the director of the B.S.I. was in North America, he paid a special visit to Toronto in order to discuss outstanding points with the C.S.A. Approvals Division and to meet the chief electrical inspectors of all the Canadian Provinces.

The Approvals Agency has found it possible to devote time to the preparation of a special booklet which tells exporters all they need to know about the subject. This publication ("The Canadian Standards Association Approvals System") is available at 3s 6d from the B.S.I./C.S.A. Approvals Agency, British Standards Institution, 24, Gillingham Street, London, S.W.1.

The first part describes the working of the C.S.A. approvals system and the operation of the Agency in London. It details not only the steps to be taken by the manufacturer when approval is required for a repetitive type of appliance or piece of equipment, but also the alternative methods whereby approval can be obtained for a special type or specially-designed piece of electrical equipment, of the kind which often forms a "one-off" order, and for which the cost of the normal C.S.A. approval procedure would be prohibitive.

An important section of the booklet is devoted to technical requirements which are regarded as essential in Canadian practice, but are either not specifically mentioned in Canadian approval specifications or require amplification to be readily understood by a British designer.

Appendices to the booklet give the provincial and municipal chief electrical inspectors of Canada; classify equipment under the different approval services; list the approval specifications which form Part 2 of the Canadian Electrical Code; and summarize the regulations governing the marking of approved equipment.

Brightness Engineering

IN a paper which he read to the Tees-Side Group of the Illuminating Engineering Society at Middlesbrough (17th December), Mr. W. Robinson (E.D.A.) outlined progress made in the study of the brightness relations necessary for ease and comfort of seeing. Brightness engineering, said Mr. Robinson, was a term coined to embrace the application of the results of this work to lighting practice. Its prospects of successful adoption depended on the acceptance of agreed brightness criteria and on the existence of adequate brightness design data and suitable instruments for brightness measurement in interiors. There was general agreement that the control of all interior brightness ratios in relation to the work and source brightnesses was essential for sustained, comfortable vision; there was a growing tendency to use a 3 : 1 ratio as a guide.

Mr. Robinson discussed the experimental background of this ratio and suggested that the time was ripe for an investigation, under the ægis of the Illuminating Engineering Society, into the establishment of a generalized brightness code. Brightness design data were now available in the form of inter-reflection tables which enabled the average brightness of the floor, walls and ceiling to be predetermined.

Mr. Robinson expressed the opinion that though the methods of brightness measurement now available were adequate for the purpose of brightness engineering, cheaper and more compact instruments were required. The ultimate role of the lighting engineer was to prescribe, as well as dispense, the conditions for good and comfortable seeing.

Trinidad's Power Prospects

Large Increase in Output Planned

ESTIMATES of maximum demand and output in the area of the Trinidad and Tobago Electricity Commission indicate a greatly accelerated expansion during the next eight years. Last year the Commission, of which Mr. K. W. Finch, B.Sc., A.M.I.E.E., is general manager, generated or purchased 55·3 million kWh. Compared with this, it is expected that the output will have doubled by 1954 and by 1960 will have risen to more than 220 million kWh.

At present the main power station is at Port-of-Spain, where 50·9 million kWh was generated in 1951, 44·3 million kWh by steam sets and the remainder by diesel. During the year progress was made on the installation of additional plant at the station by Babcock & Wilcox and the B.T.H. Co., while work also proceeded on the construction of a new station at Penal. There is, at present, 52 MW of private generating plant in Trinidad, consisting of about 273 prime movers in 123 power stations. As the Commission's mains reach these stations the smaller ones are likely to be closed down and the larger stations run in parallel with the Commission's system.

Analysis of Sales

Plant limitations made it impossible to start giving supplies to the new areas in the south, but some 1,850 new consumers were connected in the areas already served, making the total number 14,597. About 24,000 dwellings are on the route of existing mains in the areas already supplied in the north, excluding Port-of-Spain (total dwellings according to 1946 census 33,211), and of these 13,500 (57 per cent) now make use of the supply. Total sales in 1951 were 48·4 million kWh, including a bulk supply of 26·9 million kWh to the Port-of-Spain Corporation. Retail sales comprised the following (in million kWh). Domestic light and power, 6·0; general lighting, 2·0; commercial light and power, 2·3; industrial power, 10·6; and street lighting, 0·6.

Sufficient work was done on the Penal 66 kV substation to enable the line from San Fernando to Penal to be made alive, so providing a supply for the contractors working on the Penal power station site. It was impossible to finish this substation as the 33 kV air-break switches had not arrived. At the request of the Sugar Manufacturers' Association the 66 kV line was raised to provide a minimum clearance of 27ft where it went through cane fields. Work was continued on a 33 kV line from Penal to Fyzabad, the line being completed as far as the Fyzabad substation. An agreement having been completed with Trinidad Leaseholds, Ltd., covering a supply to Forest Reserve, the section of the line from Fyzabad to Forest Reserve was surveyed, the trees were cleared and most of the poles had been erected by the end of the period under review. A spur line to the power station of Apex (Trinidad) Oilfields, Ltd., at Fyzabad was surveyed but the work was not proceeded with as the company does not need a supply until 1954. Two 0·3 sq in 6·6 kV aluminium sheathed cables and a pilot cable were laid to the Coconut Growers' substation.

A 12 kV line between Freeport and the West Indian Oil Industries' factory at Carapichaima was completed but it was necessary to make temporary use of 5 kV insulators as no 12 kV insulators were available. The Arima distribution voltage was increased from 2·3 kV to 4 kV and an interconnecting line was erected between Arima and Arouca to meet the increased demand at Arima and to enable a supply to be given to a new textile mill.

The Commission's accounts show a total revenue from the sale of electricity of $1,922,149, with miscellaneous revenue of $12,395 and $362 profit on installation work. A surplus of $1,830 was carried forward.

Grit Nuisance at Bradford

MR. W. J. Taylor, M.P. for North Bradford, who took up the question of the grit nuisance from the chimney of Valley Road power station with the Ministry of Fuel and Power, has now received a reply from the Ministry. This states that in the Bradford station 40 per cent of the plant is over age and depends on boilers which will be scrapped in the next year or two. Though these are used as little as possible they are almost certainly the source of any trouble. The time taken to design and fit up-to-date grit arresting plant, even if it were an economical proposition, could very well be longer that the remaining life of these boilers. The best solution lies in getting rid of these old boilers as soon as possible. In the meantime, if the B.E.A. continues to be able to commission plant faster than the load grows, this out-of-date plant will be used less, and less grit will be thrown out from the chimneys. The new stations at Skelton Grange, Wakefield and Ferrybridge already help in that direction.

Commerce and Industry

Iron and Steel Consumers' Council

Equipment for Venezuelan Oilfields

THE first report is available (H.M. Stationery Office, price 4d) of the Iron and Steel Consumers' Council set up in July, 1951. Among the members are Sir Harry Railing (G.E.C.), Sir Andrew McTaggart (Balfour, Beatty) and Sir John Hacking (B.E.A.).

Dealing with supply and demand the Committee refers to the improvement which has set in and says it is confidently hoped that the total supply of steel ingots and steel for castings will reach 18 million tons in 1952, against less than 16¼ million tons in 1951. Although the Council recognizes the necessity of price control it has suggested to the Ministry of Supply that frequent changes should be avoided, especially where the change is small.

The Council places on record its request to the Minister that it should be made clear in the new Iron and Steel Bill that the Iron and Steel Board's duties will include the proper distribution of iron and steel among consumers. It has also asked for the exclusion from the supervision of the Board of those concerns which use the processes of casting, rolling or forging in the course of their manufacture of products, but whose main business is in other branches of industry.

Generating Plant for Malaya

As part of the Government's efforts to establish better social conditions in Malaya, the National Gas and Oil Engine Co., Ltd., is supplying fifty-eight generating sets for use in resettlement camps there. The value of the contract is £45,000. It has been placed on behalf of the Central Electricity Board, Malaya, through the Alliance Engineering Co., Ltd., who are the company's agents in Malaya. The generating sets will supply electricity for floodlighting the outer perimeters of the camps while they are armed against terrorism and pillage. When peace is restored to the country, the sets will provide electricity for ordinary domestic use. Each set comprises a National MBAE type horizontal single cylinder oil engine which develops 20 h.p. at 500 r.p.m., and a Hopkinson's 12 kW alternator. V-rope driven from the engine.

Fire Grading of Buildings

There has been published by the Ministry of Works under the above title Parts II, III and IV of Post-War Building Studies No. 29 (H.M. Stationery Office, 4s 6d) which discuss, respectively, the equipment of buildings for detecting and extinguishing fires, precautions relating to occupants and risks from chimneys, flue pipes and hearths. Part I was published in 1945.

Radio Trades Examinations

The closing date for entries for the television servicing certificate examination is 15th January. The examination will be held on 4th and 6th May and 20th June. For the radio servicing certificate examination the closing date for entries is 1st February and the dates of the examination are 28th and 30th April and 16th May. The examinations are held by the Radio Trades Examination Board in conjunction with the City and Guilds of London Institute. Entry forms may be obtained from the secretary, 9, Bedford Square, London, W.C.1.

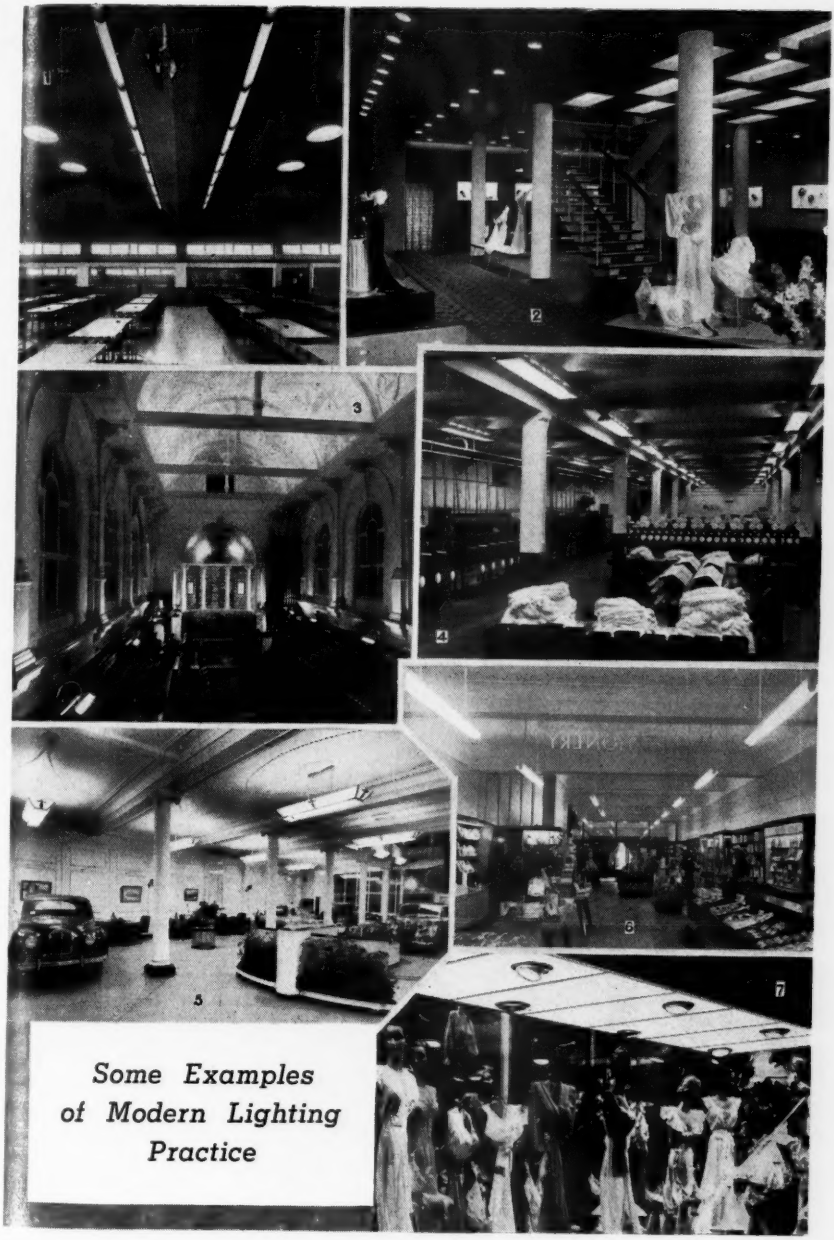
Rhodesian Railway Control

The Rhodesian Railways have awarded to the Siemens and General Electric Railway Signal Co., Ltd., an order for the supply of a further section of centralized traffic control extending from Gwelo to Gatooma, forming the middle stretch of the important rail link of 296 miles between Bulawayo and Salisbury. Equipment has already been supplied by S.G.E.

(*Continued on page* 36)

RECENT LIGHTING INSTALLATIONS (see opposite page)

(1) Continuous fluorescent lighting at the new works canteen of Marconi's Wireless Telegraph Co., Ltd., Chelmsford (Edison Swan Electric Co., Ltd.). (2) Cold and hot cathode lighting and tungsten lighting at the Dolcis Shoe Store, Bristol (Courtney, Pope (Electrical), Ltd.). (3) Combined fluorescent and tungsten lighting in Mill Hill School Chapel (British Thomson-Houston Co., Ltd.). (4) Wick Plaiting Department, Price's Patent Candle Co., Ltd., Battersea (Benjamin Electric, Ltd.). (5) Fluorescent pendants in the showroom of Austin Motor Export Corporation, Ltd., Oxford Street, W.1 (General Electric Co., Ltd.). (6) "Sleray" fluorescent lighting at the new premises of W. H. Smith & Sons, Southsea (Siemens Electric Lamps & Supplies, Ltd.). (7) Louvred lighting in the windows of S. Weiss, Ltd., London, W.1 (Franco-British Electrical Co., Ltd.)


Some Examples
of Modern Lighting
Practice

for the first section of this link between Bulawayo and Gwelo, and the system is in traffic operation as far as Somabula. The new installation involves the provision of a central traffic control machine with its associated field stations, 89 miles of track circuiting, with crossing loops, as well as approximately 200 running and subsidiary signals. In addition, there will be many hundreds of signalling relays for interlocking and control purposes.

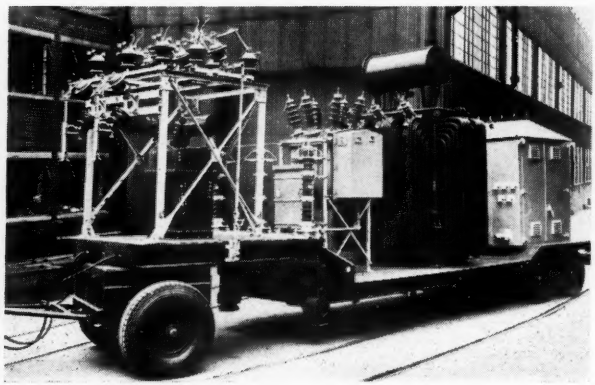
Mobile Power Unit for Venezuela

An electrical substation, mounted on a trailer and weighing nearly 40 tons, is on its way to Venezuela for use in Shell's oilfields along the Bolivar coast around Lake Maracaibo. The plant, costing about £17,500, has been made by the Parolle Electrical Plant Co., Ltd.

For these oilfields the electrical transmission system comprises double primary lines at 33 kV 3-phase 60 c/s some 60 miles long, with a large number of secondary branch feeders operating at 6·9 kV. Situated at intervals are fourteen static substations to step down power from 33 kV to 6·9 kV, some of which are now at times approaching their full loading capacity. The mobile plant will augment the supply wherever it is required.

The main power transformer is a 4,500 kVA 3-phase unit having a no-load ratio of 33/6·9 kV connected delta/delta and provided with an off-load tapping switch. There is also an auxiliary 15 kVA single-phase 33/0·23 kV transformer for local lighting and power. Both of these units were manufactured by C. A. Parsons & Co., Ltd. The main switchgear is of A. Reyrolle & Co.'s design and manufacture, consisting of one 33 kV outdoor type circuit breaker of 500 MVA rating and a steel kiosk having three compartments, one of which houses two 6·9 kV metalclad vertically isolated, oil-immersed, feeder circuit breaker panels connected, via roof bushings on the kiosk, to the l.v. side of the main transformer and by means of flexible cables from roof bushings to the 6·9 kV overhead lines. The second compartment contains the control and protective equipment for the 33-kV circuit breaker in addition to housing the tripping battery which is rectifier charged from the 230 V supply. The third compartment contains the control, protective and metering equipment for the 6·9 kV circuit breakers. External plug points are incorporated on the kiosk for the local lighting and power supplies. The 33 kV lightning arrestors, made by the General Electric Co., are mounted on resilient floor pads and the 33 kV line isolator and fuse isolator (the latter for controlling the auxiliary transformer) were manufactured by Switchgear and Equipment, Ltd. The trailer was made by R. A. Dyson Co., Ltd.

Mobile electrical substation on its trailer



Organic Finishing Group

The Institute of Metal Finishing will hold the inaugural meeting of the newly formed Organic Finishing Group at the Charing Cross Hotel on Thursday, 19th March.

The programme includes luncheon, inaugural meeting, and two technical papers followed by discussion, with a break for afternoon tea. The committee which will be in charge of the Group's activities for the following year will be elected.

George Kent Canadian Company

A company has been formed and has commenced operations in Canada under the title of Kent-Norlantic, Ltd., at Horner Avenue, Toronto, 14. This organization takes over from the parent company, George Kent, Ltd., the responsibility of marketing, throughout Canada, Kent industrial instruments, certain other products, and the Norlantic range of domestic and industrial water and steam meters. Arrangements are being made for the manufacture and assembly in Toronto of the Norlantic range and other products, and for stocks to be held to meet Canadian delivery requirements both of new equipment and spares. The present staff, Canadian and British, includes production, research and development engineers who will be responsible for the design of equipment to Canadian standards under the supervision of the president, Mr K. R. Wells, who was

previously manager of the Canadian branch office of George Kent, Ltd. Other directors are Mr. W. G. C. Howland and Mr. R. G. Kent, sales director of George Kent, Ltd.

B.E.A.M.A. Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the November figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 13th December is deemed to be 141s 6d. The " cost of material " figures are as follows:—

For electrical machinery and equipment: the Board of Trade index figure published on 13th December is 161·8.

For turbo-generating and allied plant: materials used in mechanical engineering industries, 147·8; blast furnaces and iron and steel smelting and rolling (40 and 41), 142·7; price of ⅜in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 12th December), 3s 11⅝d.

Outstanding contracts covered by the Board of Trade intermediate products index: The index figure for intermediate products (13th December) is 359·1.

Belfast Appointment Decision

Belfast Corporation Electricity Committee is to ask the City Council to approve the decision of a sub-committee not to appoint an acting deputy electrical engineer. The Committee decided that, in view of the terms of the appointment of Mr. R. P. Watson as acting city electrical engineer and general manager, it would be inadvisable to recommend such an appointment.

A short time ago Belfast City Council petitioned the Northern Ireland Government to hold an inquiry into the working of the Corporation's electricity undertaking, and the Government has under consideration the lines upon which such an inquiry should be instituted.

Aluminium Sales

Upon the expiry of the contract between the Ministry of Materials and the British Aluminium Co. it has been decided to discontinue the arrangement under which the Ministry buys the company's output of virgin aluminium for resale along with imported metal. Most of the metal produced will be used in the company's own works, but it has agreed to continue to supply to other users who require their metal for special purposes; such sales will be licensed by the Ministry of Supply in accordance with any distribution scheme for the time being in operation. The company will sell at prices not exceeding the Ministry of Materials' current prices for imported aluminium.

The British Aluminium Co.'s production of virgin metal is of the order of 30,000 tons a year. The annual United Kingdom consumption is about 200,000 tons. It is understood that these arrangements will not affect the Ministry's selling price.

Metal Controls Relaxed

The Minister of Supply has made an Order removing from price control unwrought brass and scrap of gilding metal, cupro-nickel and brass. This is made possible by the improved supplies of these metals. Secondary copper and copper scrap remain subject to price control for the time being. The Order, the Copper, Zinc, etc., Prices (No. 6) Order, 1952, came into operation on 31st December.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £166 0s 0d
COPPER, H.C. Electro	ton £285 0s 0d
Fire Refined 99·70 per cent ..	ton £282 10s 0d
Fire Refined 99·50 per cent ..	ton £274 0s 0d
COPPER Tubes	lb 2s 8¾d
Sheet	ton £340 0s 0d
H.C. wire and strip	ton £336 0s 0d
LEAD, English	ton £103 10s 0d
Foreign	ton £101 0s 0d
MERCURY	flask £70 10s 0d
TIN	ton £949 0s 0d
ZINC, G.O.B. Foreign	ton £110 0s 0d
Electrolytic	ton £114 0s 0d
BRASS Tubes	lb 2s 2¾d
Sheet	ton £277 15s 0d
Wire	lb 2s 8¾d
PHOSPHOR BRONZE	
Wire	lb 4s 1¾d
RUBBER, No. 1 R.S.S. spot ..	lb 26¼d–27d

Lower Tungsten Ore Prices

The Ministry of Materials announces that, as from 30th December, its buying prices per long ton unit c.i.f. U.K. port for tungsten ores of standard 65 per cent grade and ordinary quality will be:—Wolframite, 370s and Scheelite, 360s.

Allocation of Nickel

During the first quarter of 1953 the United Kingdom will receive 5,434 metric tons of nickel from a total allocation of 37,273 tons. The United States' share will be 25,013 tons. The Manganese-Nickel Cobalt Committee of the International Materials Conference says that the total amount of nickel available is only 0·6 per cent higher than in the fourth quarter of 1952. Therefore the recommended allocation still falls considerably short of requirements and there is still a need for strict economy in the use of the metal.

" Demonstrator's Bulletin " Service

A new service has been started by the Domestic Appliance Division of the English Electric Co., Ltd., by the distribution of an attractive folder entitled " Demonstrator's Bulletin " which has been sent to demonstrators throughout the country. The folder has a sturdy cedar-brown cover, stamped with the

company's symbol and slogan "Bringing You Better Living," and contains the first four of a series of information sheets intended to form a permanent reference book on "English Electric" domestic appliances. The Bulletin has four sections covering the refrigerator, cooker, washing machine and food mixer. The sections are readily identified by a distinctive colour for each appliance. The folder is loose-leaf so that future Bulletins can be added at any time. The "Demonstrator's Bulletin" service will provide factual information about the appliances, suggestions on the presentation of special features to the customer, and hints which may be passed on to the housewife to help her to make the best use of the appliance.

Refitting of the "Monarch"

Palmers (Hebburn) Co., Ltd., have completed refitting the Post Office cable ship *Monarch* and the vessel's next job is to be the relaying of a cable 1,700 miles long across the Atlantic from Brazil to the Cape Verde Islands for an Italian company. The work is expected to take only twelve days.

Works Visit

During December the British Thomson-Houston Co.'s Rugby Works were visited by the British Productivity Team on Industrial Engineering. The visit was one of several similar tours of large industrial concerns in this country that the team, under the leadership of Mr. W. F. Garnham, is making before leaving for America in the *Queen Mary* on 15th January. Mr. J. H. Cribb, head of the methods development section, B.T.H., Rugby, has been selected as a member of this team.

Management Accountancy

The Institute of Cost and Works Accountants has established a Fellowship in Management Accountancy. It is open to associates of the Institute and to members of other institutes of accountants in Great Britain and Ireland, and certain overseas bodies of accountants. The first examination was held earlier this month, and subsequent examinations will be held during the second week in June in each year. A syllabus is obtainable from the Institute at 63, Portland Place, London, W.1.

Catalogues and Lists

Stephen Glover & Co., Tudor House, Bridge Street, Walsall.—Illustrated priced brochure dealing with infra-red and radiant heat health lamps, and conduit fittings and wiring accessories catalogue.

Allen West & Co., Ltd., Lewes Road, Brighton, 7.—"Control Gear for Machine Tools"—an illustrated folder describing general features and uses.

J. H. Fenner & Co., Ltd., Hull.—Illustrated catalogue relating to "Hainsworth" variable-speed drives for industrial V-belts and pulleys (200/1).

British Insulated Callender's Construction Co., Ltd., 21, Bloomsbury Street, London, W.C.1.—Publication No. 12 dealing with the high voltage a.c. traction equipment installed on the Lancaster-Morecambe-Heysham section of British Railways.

Concordia Electric Wire & Cable Co., Ltd., Long Eaton, Nottingham.—Publication 752C dealing with "Concathene" thermoplastic cables and flexible cords.

Keith Blackman, Ltd., Mill Mead Road, Tottenham, London, N.17.—Illustrated catalogue giving details of "Tornado" paddle wheel type fans for industrial purposes.

Sharples Centrifuges, Ltd., Woodchester, Stroud, Glos.—Bulletin 452 describing the bowl functioning principles of the company's super centrifuges.

Siemens Electric Lamps & Supplies, Ltd., 38/39, Upper Thames Street, London, E.C.4.—Illustrated priced catalogue dealing with the complete range of "Siemens" lamps (1600).

Trade Announcements

The Eastern Counties office of the **Electrical Apparatus Co., Ltd.**, is now at Commerce Chambers, 14, High Street, Ipswich (telephone: Ipswich 51791).

The London address of **Cable & Switch Gear (Farnley) Installations, Ltd.**, is now at 303, Brixton Road, S.W.9 (telephone: Brixton 8004).

Belfast Castle floodlit on the occasion of a recent Philips radio trade convention. Eight Philips "Reigate" fittings housing 140 W SO/H sodium lamps were used around three sides of the building, with concealed mellow fluorescent lighting in the porch. The total consumption was less than 1½ kWh an hour

Germanium for Electrical Purposes

By A. G. THOMSON

Review of Collaborative Research

As a result of collaboration between research stations of the D.S.I.R. and commercial firms, there is no longer any need to import high purity germanium, since material of adequate purity for the reliable manufacture of rectifiers and transistors is now being commercially produced in Britain. This is a particularly happy example of the benefits which can be achieved by co-ordinated programmes of research.

This important development originated before the war, when it was reported that germanium had been discovered in British coal. Its occurrence has been studied by the Fuel Research Station and a survey has shown that the average concentration is about seven parts per million. There appears to be no marked variation in the proportion of germanium in British coals, except that coals from South Wales are, on the whole, deficient in this element.

Sources of Supply

Germanium, a relatively hard metal with a density of about 5·4, possesses certain unique properties of potential value to industry, but the scarcity of this element has hindered the development of commercial applications. Though of fairly widespread occurrence, it is seldom found in quantities large enough to permit of extraction on a commercial scale, both the principal germanium minerals (argyrodite and germanite) being very rare. In the United States there is a limited output of germanium from the residues of zinc ores, and it is believed that production from this source is capable of yielding from 1,000 to 1,200 lb a year.

Clearly the occurrence of this scarce metal in British coals was of great practical significance if an economical method of discovery could be devised. Investigators at the Chemical Research Laboratory (C.R.L.) therefore studied the composition of coal ash, but they found that the germanium content was relatively small, largely due to the fact that during combustion much of the germanium present in the coal was carried up the chimney with the combustible gases, extruded into the atmosphere and lost.

Recovery from Flue Dust

Consideration was then given to the possibility that improved recoveries of germanium might be obtained from the dusts deposited inside high chimneys and samples were accordingly taken from the flues at various gasworks. It was found that the producer systems of gasworks yielded about $\frac{3}{4}$ per cent of germanium and a like amount of gallium, the flue dusts from British coals being appreciably richer in both metals than the American zinc residues. In 1937 Sir Gilbert Morgan and Dr. G. R. Davies of C.R.L. made the pioneering study of the germanium and gallium content of coal ash and flue dust.

Research led to the development of a method of recovery based on the distillation of flue dust with hydrochloric acid to form germanium tetrachloride, which boils at 83 deg C and is distilled off. The gallium remains behind in the acid residue, from which it is extracted with ether as gallium trichloride. The germanium is converted to metal form by reduction of the dioxide with hydrogen to produce a grey powder, which can be converted to massive form by melting it under molten sodium chloride.

Germanium and gallium produced at the Chemical Research Laboratory have been sent out on loan for research purposes to various institutions throughout Britain and have even been dispatched to Canada.

Before germanium could be used industrially it was necessary that its physical properties should be thoroughly understood and for this purpose investigations have been carried out over a long period at the

National Physical Laboratory. Latterly the extraction of both metals from flue dust has been commercially undertaken and germanium has become available in limited quantities for commercial use.

For several years there has been a concerted effort in industrial and Government laboratories to obtain elementary germanium of very high purity. During the war American scientists were developing important uses for germanium on the "cat's whisker" principle. In radar and similar applications germanium crystals are used for the rectification of microwaves. Germanium is therefore of particular interest to electrical and radio manufacturers, but for electrical purposes a high standard of purity is required, among the most objectionable impurities being arsenic, which is present in the material recovered from flue dusts.

Radio Applications

Outstanding and urgent problems requiring investigation in the field of semiconductors have been considered by the Radio Materials Committee of the Radio Research Board, which has emphasized the importance of germanium as a material having application in rectifying and amplifying devices. Though crystal diodes are already widely used in many circuit applications formerly requiring a thermionic diode, the performance of crystal triodes has been adversely affected by such disadvantages as poor reproducibility, high noise, low power rating, and limited frequency response. The performance of both crystal diodes and crystal triodes is very dependent on the concentration and nature of the impurities which are present in the germanium.

Arrangements were therefore made for the Chemical Research Laboratory to investigate techniques for the purification and analysis of germanium. The radioactive tracer technique was used to assess the efficiency of the various stages used in existing methods for the removal of arsenic, and new methods for the chemical separation of arsenic from germanium were developed.

This investigation has been given high priority and has already led to the development of a simple method of reducing the arsenic content in germanium tetrachloride to 1 part in 10^{10}. It has been confirmed that in the 99·99 per cent germanium oxide supplied commercially, arsenic is by far the most preponderant impurity.

At the Radio Research Station equipment and methods have been developed for examining the electrical properties of germanium and other semi-conductors. The special equipment used in this investigation includes a unit for determining rapidly the current/voltage characteristics of semi-conductor diodes and triodes, an audio-frequency system for measuring the concentration and mobility of the current carriers, and a bridge and tuned amplifier by means of which measurements of the a.c. impedance of a rectifier can be made over the frequency range 5 to 10,000 c/s. Since the electrical properties of semiconductors are very dependent on temperature, provision has been made for placing the items to be measured in a thermostatic enclosure. Associated with this work is an investigation of noise in semi-conductors. The spectral intensity of excess noise developed by circuit elements carrying direct current increases rapidly with decrease of frequency. Measurements have, therefore, been concentrated in the band 0·1 c/s to 100 kc/s, and rectifiers have been examined together with the semi-conducting materials from which they are made.

The post-war commercial activities of Johnson, Matthey & Co., Ltd., and the General Electric Co., Ltd., in the field of germanium research have been discussed in articles which appeared in 1950 and 1951.

Properties of Gallium

Research on germanium and gallium is still proceeding, and it is possible that further work may result in the development of commercial applications for the latter metal. The N.P.L. is at present devoting considerable attention to the electrical properties of gallium, including the remarkable variations in resistivity in the axial directions of its crystal (anisotropy). Variations of as much as 7 to 1 are encountered, the values depending on the particular direction across the crystal in which the measurements are taken. No other metal with such high variations through different directions of the crystal is at present known. It has been found that crystals of gallium can be made to grow in any desired direction, depending on the shape in which the original crystal is allowed to form.

Following the discovery of the exceptionally wide differences in resistivity in the

axial directions of the gallium crystal, efforts have been directed to determining the resistivity at ultra-low temperatures. The Chemical Research Laboratory is co-operating in this work with the Physics Division of the National Physical Laboratory. In view of the possibility that even the merest trace of impurities might appreciably alter the electrical properties of gallium, the Chemical Research Laboratory has endeavoured to purify its own metal still further. Single crystals of material obtained by a new method gave conductivities in the axial directions which were in complete agreement with the results obtained with earlier batches of the metal. The elasticity of the metal has also been determined, the method employed being to determine the velocity of sound in accurately dimensioned single-crystal cubes. Though gallium is potentially useful to the electrical industry, much research is still needed before the stage of commercial development is reached.

Both germanium and gallium are still expensive, but prices should tend to come down as new applications are found and larger quantities are extracted. Since the aggregate tonnage of flue dust available for treatment is unlikely to exceed a few hundred tons annually, it seems probable that both metals will have to be reserved for very highly specialized applications. Should demand become sufficiently great, however, it is possible that eventually germanium and gallium might be recovered from almost every works where coal is consumed on a sufficiently large scale.

CANADIAN ELECTRICAL IMPORTS

IMPORTS of electrical goods into Canada during the first half of 1952 showed a small rise in value on January–June of the preceding year. The total was $62,027,000. Noteworthy among increases recorded were those in dynamos, transformers, switches, and telegraph and telephone apparatus.

The United Kingdom improved its share of trade in the larger motors and in the rheostat and controller group but in telegraph material did badly compared with the United States. While these two countries retained the bulk of the electrical import business, West Germany was more in evidence, having doubled her imports of lighting fixtures and quadrupled those of motors. Holland trebled her sales of radio valves and also sent more dry shavers. Swiss imports of steam generators and parts increased. Japan sold fewer metal filament lamps but at greater cost.

Class of Goods	Jan.-June, 1952 $ (000)	Inc. or dec. on first half 1951
Batteries, storage	449	+ 45
From United Kingdom	25	− 15
„ United States	424	+ 60
Dynamos and parts	4,272	+ 1,256
From United Kingdom	418	+ 249
„ United States	3,850	+ 1,030
Electric meters	750	− 106
From United Kingdom	88	+ 12
„ United States	649	− 121
Motors valued at less than $10	201	− 195
From United Kingdom	20	− 57
„ United States	168	− 151
Motors, other, and complete parts	8,058	+ 107
From United Kingdom	1,453	+ 827
„ United States	6,488	− 763
Rheostats, controllers, etc.	3,887	− 331
„ United Kingdom	165	+ 88
„ United States	3,667	− 530
Transformers and parts	1,796	+ 478
From United Kingdom	534	+ 158
„ United States	1,106	+ 284
Switchgear for use in coal mines	74	− 71
From United Kingdom	39	− 16
„ United States	35	− 55
Switches, switchboards, etc.	4,829	+ 891
From United Kingdom	380	+ 185
„ United States	4,187	+ 567
Telegraph apparatus	1,592	+ 752
From United Kingdom	96	+ 62
„ United States	1,487	+ 682
Radio sets and other radio apparatus (excluding valves) n.o.p.	9,497	− 1,833
From United Kingdom	790	+ 10
„ United States	8,550	− 1,940
Telephone apparatus	4,499	+ 687
From United Kingdom	1,330	+ 522
„ United States	3,165	+ 161
Electric steam generators and parts of a kind not made in Canada	659	− 1,459
From United Kingdom	473	− 621
„ United States	48	+ 24
Electric precision instruments	1,633	+ 307
From United Kingdom	104	+ 32
„ United States	1,524	+ 271
Torchlights, flashlights, side and tail lights	442	− 210
From United Kingdom	24	− 14
„ United States	373	+ 13
Lighting fixtures and appliances	2,069	− 669
From United Kingdom	15	− 22
„ United States	1,914	− 663

ELECTRICITY SUPPLY

Tariff Changes in the Midlands

Progress of Singapore Project

INCREASES in some of its standard tariffs are announced by the Midlands Electricity Board. They include the raising of the secondary charges of the private dwelling house and combined premises tariffs from $\frac{3}{4}$d to $\frac{7}{8}$d/kWh, with effect after the first normal meter readings following 1st January. Changes in the tariffs for large industrial and commercial consumers come into force after the meter readings nearest 1st April. In the case of industrial consumers the first step in the m.d. part of the tariff will be increased from 6s 9d to 7s 6d/kVA a month, with a corresponding increase of 9d/kVA for larger demands, while the kWh charges will be advanced from 0·55d to 0·57d (up to 100,000 kWh) and from 0·50d to 0·52d thereafter. The first step of the demand charge applicable to large commercial consumers remains at 10s/kVA a month, but the second step is being raised from 7s 6d to 8s 6d, while the running charge goes up from 0·6d to 0·62d/kWh. This charge and the corresponding charges to large industrial consumers are subject to variations of 0·0008d per kWh for each 1d difference in the price of coal from the basic figure of 38s/ton.

The revised tariffs are expected to yield an additional revenue of £1,500,000 a year. Since the standard tariffs were introduced in June, 1951, the Board has had to meet substantial increases in costs: in the current year these have amounted to more than a million pounds and they are likely to be nearly $1\frac{1}{4}$ million pounds next year. The Board states that if there are no further large increases in costs the anticipated revenue in 1953–54 should be enough to meet costs and pay off the adverse balance in the current year.

Wind Power in Holland

In the Netherlands National Budget for 1953 it is proposed to make funds available for utilizing existing windmills to generate electricity. Credits will be granted to the owners of the mills for the purchase of the apparatus required.

Electricity in L.C.C. Schools

In the next section of its programme for the installation of electricity in gas-lit schools the L.C.C. Education Committee proposes to include Telferscot County Primary and Secondary Schools (Wandsworth, Clapham) and the following nine County Primary Schools:—Ballamore (Lewisham South), Bannockburn (Woolwich East), Forster (Islington East), Gordonbrock (Lewisham North), Horham (Wandsworth, Putney), John Stainer (Deptford), Lyndhurst Grove (Camberwell, Dulwich), Meridian (Greenwich), and Rotherfield (Islington East). The work will be undertaken as part of the 1952–53 programme of education building works costing less than £6,500 each, and it is hoped to start work at the rate of one school a week. The estimated capital liability is £38,250.

Substation at Outfall Works

The L.C.C. Rivers & Drainage Committee reports that a new electricity substation is to be constructed at the northern outfall works to serve the penstocks for new effluent channels and culverts from the primary sedimentation tanks. The total cost of the substation is estimated at £18,000.

Irish Rural Electrification

Electricity was recently switched on to 300 houses in the Rahan area of County Offaly. This is the fourth area in the county to get electricity under the rural scheme. A large area of Co. Donegal between Ardara and Glenties will shortly receive electricity, following the switch-on there, among the districts included being Kilraine and Tullyard.

Higher Swedish Output

The total production of electric power in Sweden amounted to 19,582 million kWh in 1951, an increase of 8 per cent as compared with the preceding year. Out of the total, 93·9 per cent was accounted for by hydro-electric power. This proportion will have been increased in 1952 by the completion of the big Harspranget plant within the Arctic Circle with an annual output of 2,000 million kWh. Present estimates put the production of hydro-electric power in 1952 at about 20,200 million kWh.

Waikato Development

The proposed hydro-electric stations at the Huka Falls and Aratiatia Rapids—scenic attraction of the Waikato River—could develop

100,000 kW and bring in £1 million a year to the State Hydro-Electric Department. This was stated by the Minister in charge of the Department (Mr. W. S. Goosman) at the conference of the New Zealand Electrical Supplies Association at Rotorua. Mr. Goosman explained that the work being carried out at Huka Falls and Aratiatia Rapids was purely investigatory, and would interfere as little as possible with the natural beauty of the river.

High-head Power Plant

Power from the 82,000 h.p. Wahleach development of the B.C. Electric Railway Co. in the Fraser Valley is now being fed into the Vancouver network. From Wahleach Lake the water falls 2,000ft to the power plant, situated on the Trans-Canada highway midway between Chilliwack and Hope, giving this development the highest head of any Canadian hydro-electric unit. Power from Wahleach is being transmitted initially at 230 kV, but this is to be stepped up later to 345 kV, the line being the first in North America designed and built to take this high voltage.

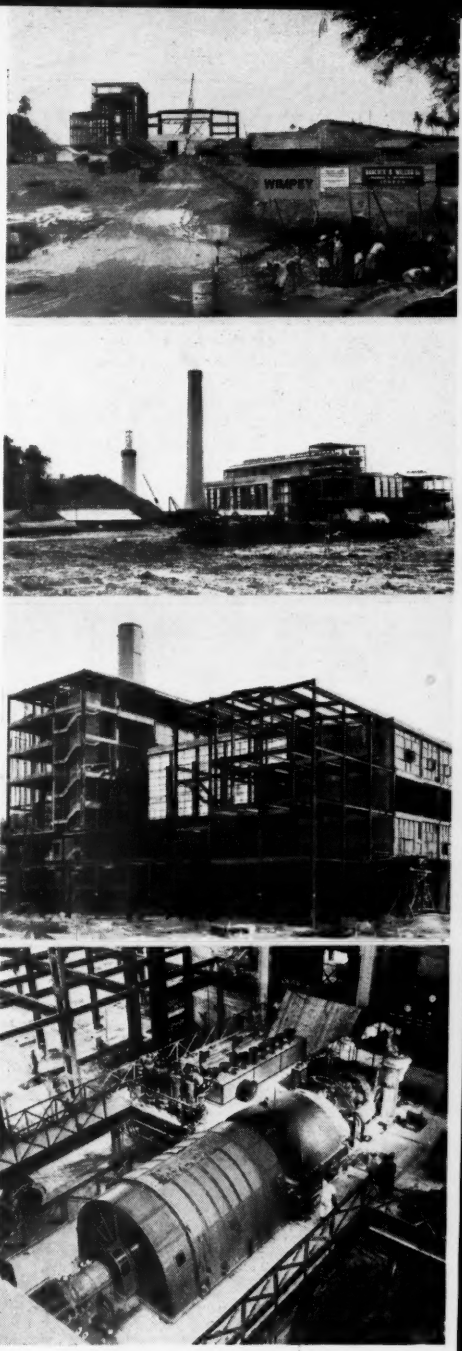
Electricity for Municipal Houses

Thornaby-on-Tees Town Council has asked the North Eastern Electricity Board to submit a tender for installing electricity in houses in the Northumberland Road area. About 250 houses are involved and the cost is estimated at £10,000.

Tenders have been received by Newcastle-on-Tyne City Council for a £20,000 scheme for installing electricity in 930 gas-lit houses on the Walker estate. This is the second stage of the Council's plan for installing electricity in all houses at present served only by gas.

Singapore Power Station

The rapid construction of the new Pasir Panjang power station, Singapore, is shown in the accompanying photographs received from Mr. C. C. Payne, the city electrical engineer. The contractors moved on to the site at the beginning of January, 1951, and the first photograph depicts the progress of construction a year later. The remaining photographs were taken last month when the first 25,000 kW Metropolitan-Vickers turbo-alternator and 187,500 lb/hr Babcock & Wilcox boiler were placed in commission. Eventually, six sets and nine boilers are to be installed. It is hoped to have the second boiler in service before February and the second turbo-alternator not later than May. It will be seen from the photographs that extensive temporary cladding of the building has been necessary to protect the plant and machinery against severe tropical rainstorms.



Views showing the progress of construction of the Pasir Panjang power station, Singapore

OVERSEAS ELECTRICAL TRADE

Decline in Exports Continues

FOR the fourth successive month Great Britain's electrical exports in November showed a decline compared with the corresponding month of last year. The total at £14,848,906, which is £2,050,514 below the November, 1951, figure, is also £333,101 less than in October this year, in which, however, there were two more full working days and one fewer Saturday. Sales of machinery have not been so much affected by the more difficult marketing conditions as consumer goods and the total at £4,927,639 is only £64,812 less than that for November, 1951. Actually, despite substantial reductions in purchases by Australia (from £307,658 to £72,873) and India (from £148,824 to £68,679), there was an improvement from £1,111,606 to £1,333,125 in the trade in generating plant, both South Africa (£232,825 compared with £52,551) and Canada (£131,348 compared with £32,949) greatly increasing their demands. Of special note was the considerable increase from £5,017

TABLE I.—ELECTRICAL EXPORTS

Class	November, 1951	November, 1952	Class	November, 1951	November, 1952
	£	£		£	£
Telegraph and telephone cables and wires (submarine)	25,296	—	Permanent magnets	26,848	38,638
Ditto, not submarine	469,992	902,245	Insulating cloth and tape	129,063	53,233
Wires and cables, paper insulated	611,831	886,863	Other insulating materials	125,855	77,818
Ditto, rubber insulated	807,520	431,746	Unclassified electrical goods and apparatus	638,698	513,580
Ditto, cotton, silk or artificial silk insulated	64,541	94,073	TOTAL, electrical goods and apparatus	9,877,707	8,747,316
Ditto, enamel, glass or asbestos insulated	73,995	87,929	Diesel driven generators not exceeding 200 kW	462,362	276,221
Ditto, other	294,641	258,752	Ditto, exceeding 200 kW	139,934	325,175
Commercial radio apparatus	595,044	820,668	Other generating sets	122,518	111,569
Domestic radio apparatus	459,608	298,173	Generators exported without prime movers, and parts of generators	386,792	617,160
Telegraph, telephone and signalling apparatus	1,840,484	1,286,890	Motors, railway, tramway and trolley bus	6,399	7,757
Radio loudspeakers	80,243	45,135	Ditto, other, not over ½ h.p.	160,510	115,225
Telecommunication components, n.e.s.	630,308	410,930	Ditto, over ½ h.p. but under 1 h.p.	75,284	32,689
Other telecommunication apparatus	131,712	230,717	Ditto, from 1 h.p. to 250 h.p.	531,791	455,821
Valves and cathode-ray tubes	338,452	285,177	Ditto, exceeding 250 h.p.	77,932	138,473
Carbons	30,609	19,360	Ditto, parts	91,835	113,592
Lamps, exceeding 24 V	92,436	58,773	Converting machinery	38,245	20,482
Ditto, not exceeding 24 V	56,044	19,984	Transformers, including coils	1,024,446	1,047,464
Other lighting appliances	425,528	453,882	Rectifiers for power house use	44,029	51,766
Primary batteries	184,667	168,384	Motor starting and controlling gear	224,913	250,806
Parts other than carbons	57,510	10,120	Switchgear and switchboards (not telegraph and telephone)	1,605,461	1,360,439
Accumulators for motor vehicles	244,033	122,904	TOTAL, electrical machinery	4,992,451	4,927,639
Ditto, traction	19,415	13,179			
Ditto, radio	4,171	2,989	Washing machines (not exceeding 250 lb weight)	930,223	268,251
Other portable accumulators	46,574	124,091	Ditto, parts	45,642	14,728
All other accumulators	41,537	56,095	Vacuum cleaners	302,561	163,866
Parts and accessories	78,889	85,816	Ditto, parts	51,991	21,567
Cooking appliances	309,656	86,520	Other electrically operated portable appliances and parts	280,664	175,362
Heating appliances	84,798	83,109	Portable electric tools	103,588	113,504
Parts and accessories for cooking and heating appliances	82,947	85,179	Unspecified electrical machines, machinery and parts	314,593	416,673
Flat irons	78,212	77,725	GRAND TOTAL	16,899,420	14,848,906
Commercial electrical instruments	155,947	154,413			
House service meters	153,409	86,969			
Time recorders and time switches	8,098	29,977			
Other electrical instruments	105,453	129,614			
Electro-medical apparatus (not X-ray)	51,013	50,917			
X-ray apparatus, tubes and parts	222,630	104,749			

TABLE II.—DISTRIBUTION OF ELECTRICAL GOODS AND APPARATUS

Destination	November, 1951	November, 1952	Destination	November, 1951	November, 1952
	£	£		£	£
Channel Islands	65,968	39,900	Netherlands	242,341	273,823
Gibraltar	8,592	6,727	Belgium	122,768	155,402
Malta and Gozo	9,973	9,240	France	106,905	83,069
Cyprus	24,663	40,158	Switzerland	39,743	40,661
British West Africa	170,374	199,687	Portugal	83,597	67,199
Union of South Africa ..	982,632	950,357	Spain	29,676	76,735
Northern Rhodesia	34,344	120,871	Italy	79,986	125,831
Southern Rhodesia	147,924	113,658	Austria	50,536	71,342
British East Africa	317,775	205,655	Czechoslovakia	17,163	3,229
Bahrein, Qatar and Trucial Oman	52,542	48,543	Greece	44,666	65,021
Kuwait		61,186	Turkey	56,375	182,791
India	870,995	928,097	Portuguese East Africa ..	13,667	29,618
Pakistan	191,953	167,794	Syria	17,044	12,298
Malaya	426,821	357,287	Lebanon	41,953	30,690
Ceylon	171,755	113,627	Israel	53,974	34,749
Hong Kong	279,936	132,773	Egypt	149,732	98,980
Australia	1,119,082	763,769	Arabia	56,539	12,663
New Zealand	730,094	430,344	Iraq	66,049	166,370
Canada	246,617	287,298	Iran	6,563	12,029
British West Indies	145,881	103,085	Burma	56,666	73,531
Anglo-Egyptian Sudan ..	64,371	70,827	Thailand	23,012	59,973
Other Commonwealth Countries	99,577	145,749	Indonesia	46,441	69,203
Irish Republic	618,773	290,857	China	23,314	6,069
Soviet Union	33,940	23,454	United States of America ..	83,607	144,400
Finland	62,445	71,502	Venezuela	70,742	73,049
Sweden	288,046	237,906	Peru	27,086	24,059
Norway	154,682	130,046	Chile	29,481	30,651
Iceland	41,512	7,535	Brazil	255,547	47,226
Denmark	112,049	80,854	Uruguay	17,625	10,122
Poland	35,973	14,667	Argentine Republic	190,791	22,782
Germany	47,034	83,972	Other Foreign Countries ..	217,795	406,326
			Total ..	9,877,707	8,747,316

to £67,981 in shipments to Russia, until a couple of years ago our best customer for this class of equipment.

Though there were declines in sales of the smaller sizes of motors, there was a bigger demand for units of over 250 h.p. The fall from £2,937,094 to £2,730,957 in exports of other types of electrical machinery is attributable to reduced sales of switchgear and convertors, all other classifications showing some improvement. As will be seen from Table I, trade in washing machines, vacuum cleaners and other portable electrical appliances suffered a severe set-back.

Australia, until recently by far the best market for electrical goods and machinery, is now, owing to import restrictions, only the third largest buyer, taking £763,769 worth compared with £1,119,082 in November, 1951. South Africa (£950,357) now once again heads the list of purchasers, with India (£928,097), which has latterly been the best customer, in second place. The United States increased its purchases from £83,607 to £144,400 and the steady expansion of the Turkish market continued. Trade with Scandinavia showed some contraction.

Imports of electrical goods and apparatus rose slightly from £619,657 to £624,693, the Netherlands (£184,947) and the United States (£104,464) being the biggest suppliers. The principal items were radio, telecommunications and electronic apparatus (£256,451) and valves (£118,535). Imports of generators fell from £64,132 to £18,575 but those of motors rose from £19,136 to £29,553. Overseas purchases of other electrical machinery totalled £34,202, compared with £19,074 in November last year.

Steam Raising Plant

IN a 55-page book just issued by Yarrow & Co., Ltd., the story of the design, manufacture and installation of water-tube boilers for use on land is told. It is written in a clear, concise and simple manner and there are numerous section drawings in colour to assist the reader in understanding the text.

After a general introduction there is a description of the various types of boiler made by the company, followed by a more detailed description of the Yarrow boiler; superheaters, economizers, air heaters and mechanical stokers are then treated, as are the various forms of firing. Other sections deal with manufacture, maintenance, inspection and testing, research and erection. Reference is also made to ten typical installations in various parts of the world.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

The Jerusalem Electric & Public Service Corporation, Ltd., held its annual meeting on 19th December, Mr. H. G. Balfour (chairman) presiding. In his circulated statement the chairman said in the Israel area of supply the Corporation continued to operate during the year under increasingly difficult conditions due chiefly to the abnormally high cost of operation resulting from the severe inflation which Israel was at present experiencing. Although the Government had authorized some increase in tariffs in June last, tariffs continued to be inadequate. Since the end of the year under review the Corporation had been operating at a loss. Further representations had been made in regard to revisions in the tariff structure which were under consideration by the Israel Government. Sales of electricity in the Israel area increased during the year from 22.3 million kWh to 27.6 million, but the operating surplus fell from I£109,468 to I£26,704. The revenue per kWh sold, at 26.5 mils per kWh, was nearly all absorbed by the generating cost of 25.32 mils per kWh, of which 60 per cent was represented by labour cost.

Peto Scott Electrical Instruments, Ltd.—The annual meeting was held on 22nd December, Mr. M. Campbell Jones (chairman) presiding. In his circulated statement the chairman said that sales for the last twelve months were in excess of those for the fifteen months to 30th June, 1951. Although orders to date for television receivers were satisfactory, it was not possible to forecast the trend of the market after the turn of the year, notwithstanding the Coronation, on account of the purchase tax burden. They had a large order book for Government contracts which, it was anticipated, would offset any reasonable decline in the domestic field should this occur.

Telephone Rentals, Ltd.—Shareholders subscribed over 93 per cent of the 880,000 ordinary shares recently offered to them as a rights issue.

International Combustion (Holdings), Ltd.—At an extraordinary meeting held on 19th December resolutions were passed authorizing an increase in the capital to £2,500,000 by the creation of 4,000,000 shares of 5s each, and the capitalization of £240,000 standing to share premium account, £714,539 from capital reserve, and £4,706, part of the amount outstanding to the credit of profit and loss account (making in all £959,245), to be issued as a scrip bonus of one 5s share for every 5s ordinary unit held.

Murex, Ltd., is maintaining its interim ordinary dividend at 6 per cent. The directors state, in regard to the recent rights issue of 200,000 ordinary shares of £1, that ordinary stockholders had applied for 192,096 shares, leaving 7,904 shares to be taken up by the underwriters. The new ordinary capital will not participate in the interim dividend now announced.

International Combustion Africa, Ltd., has announced a final dividend of 20 per cent, making 30 per cent for the year (against 25 per cent).

New Companies

Stuart & Co. (Canterbury), Ltd.—Registered 15th December. Capital £5,000. Wholesale dealers in and distributors, importers, exporters and manufacturers of electrical goods and equipment, dynamos, batteries, windings, etc. Directors: R. S. Cranfield and Mrs. L. M. Cranfield. Regd. office: 1/3, St. Peter's Lane, Canterbury.

Herbert Senior (Mirfield), Ltd.—Registered 15th December. Capital £2,000. To acquire the business of an electrical, radio and television engineer carried on by H. Senior at Mirfield, Yorks. Directors: H. Senior and H. H. Senior. Regd. office: 3, King Street, Mirfield, Yorks.

Telequipment, Ltd.—Registered 22nd November. Capital £1,000. Television equipment manufacturers, etc. Directors: E. D. E. Groom, J. A. Coomber and J. C. F. Copps. Regd. office: 1319a, High Road, Whetstone, N.20.

Spencer Electronics, Ltd.—Registered 11th December. Capital £1,100. Manufacturers of and dealers in electronic equipment of all kinds, etc. Directors: E. G. Orlich and K. S. S. Spencer. Regd. office: 5, Shakespeare Road, Finchley, N.3.

P.P.s' Radio & Electrical Engineers, Ltd.—Registered 15th December. Capital £5,000. To acquire the business of radio and electrical engineers, heretofore carried on by M. Pearson and L. Pointon at 119, Station Road, Langley Mill, Derbyshire, as P.P.s' Electrical & Radio Engineers. Directors: M. Pearson, L. Pointon and J. H. Hartley. Solicitors: E. S. and H. Thorpe, Heanor.

Foot's Induction Phones, Ltd.—Registered 12th December. Capital £100. Electricians, radio, television, mechanical and electrical engineers, etc. The first directors are to be appointed by the subscribers. Regd. office : 1, Upper Richmond Road, S.W.15.

Electroseals, Ltd.—Registered 19th December. Capital £2,000. Manufacturers and dealers in apparatus used in the generation, distribution and supply of electricity, etc. Permanent directors : J. R. Sinclair, director of Associated Lighting, Ltd., and Mary I. Sinclair. Secretary : Mary I. Sinclair. Regd. office : 24a, Leam Terrace, Leamington Spa.

H. C. Taylor & Co. (Manchester), Ltd.—Registered 16th December. Capital £5,000. Electrical engineers and electrical installation contractors, etc. Directors : C. H. Hodgson and J. Truin. Regd. office : 54, Mosley Street, Manchester, 2.

Electrocone Products (Manchester), Ltd.—Registered 19th December. Capital £100. Manufacturers of an electrical device for heating and applying bituminous and like substances ; electrical and mechanical engineers and contractors, etc. Directors : M. L. Sils (managing director) and V. Hardern. Secretary : V. Hardern. Regd. office : Tower Hill Works, Ellenbrook, Manchester.

Increases of Capital

Thorpe & Thorpe, Ltd.—Increased by £20,000, in £1 7 per cent non-cumulative preference shares, beyond the registered capital of £5,000. At 1st January, 1951, Peto Scott Electrical Instruments, Ltd., held the 100 ordinary shares issued.

Santon, Ltd.—Increased by £60,000, in £1 ordinary shares, beyond the registered capital of £35,000.

John H. Scott Electric, Ltd.—Increased by £5,000, in £1 shares, beyond the registered capital of £10,000.

Liquidations

Altass Electric Co., Ltd., consulting electrical engineers, 192, Cheam Common Road, Worcester Park, Surrey.—The first meeting of creditors was held on 22nd December, when the Official Receiver reported that a winding-up order was made on 24th November. A receiver and manager was appointed by the bank, who were debenture holders, on 29th October, and he had carried on the business ever since. The statement of affairs showed unsecured liabilities of £8,301 and in addition there were preferential creditors for £1,988 and debentures for £5,561. After preferential and debenture claims had been satisfied, it was estimated that there would be assets amounting to £925 available for the unsecured creditors. A resolution was passed for the appointment of Mr. N. W. Osborne, 11-12, Finsbury Square, E.C.2, as liquidator, together with a committee of inspection.

Alstans Electrical, Ltd., electrical engineers and contractors, 1047, Coventry Road, Birmingham, 25.—The statutory meeting of creditors was held recently at Birmingham, when the statement of affairs disclosed liabilities of £2,432 against net assets of £1,484, leaving a deficiency as regarded creditors of £947. So far as the shareholders were concerned, there was a total deficiency of £1,616. Resolutions were passed confirming the voluntary liquidation of the company with Mr. R. F. Bendall, of Poppleton and Appleby, 126, Colmore Row, Birmingham, as liquidator, together with a committee of inspection. Particulars of claims to the liquidator by 31st January.

Edstone, Ltd., radio and electrical factors.—Winding up voluntarily. Liquidator, Mr. K. D. Haynes, 7, Great Castle Street, London, W.1, appointed 10th December.

T. & H. Electrical Service, Ltd.—Particulars of claims by 19th January to the liquidator, Mr. N. Osborne, 11-12, Finsbury Square, London, E.C.2.

Bankruptcies

G. A. Watts, lately carrying on business with another as Watts & Watts at 185, Stockwell Road, Stockwell, London, S.W.9, and at 32, Moat Place, Stockwell, S.W.9, as electrical engineers.—Receiving order made 18th December on debtor's own petition.

K. J. Wilkes, trading as John Wilkes & Co., 30, Catford Hill, London, S.E.6, radio and electrical dealer.—First meeting 7th January at 3, Central Buildings, Matthew Parker Street, Westminster, London, S.W.1. —Public examination 23th January at the County Court, Scarbrook Road, Croydon.

J. Henderson, 17, Granville Terrace, Redcar, Yorks, lately residing and carrying on business at 82a, Galgate, Barnard Castle, Durham, electrician.—Trustee, Mr. R. F. Howe, 4, Bridge Road, Stockton-on-Tees, Official Receiver, released 15th December, 1952.

A. J. Martin, 202, Putney Bridge Road, London, lately carrying on business at High Street, Stalham, Norfolk, electrical engineer and wireless dealer.—First and final dividend of 14s in the £, payable on and after 30th December at the Official Receiver's office, Castle Chambers, Opie Street, Norwich.

F. J. Hocken, formerly carrying on business at 19, Vere Street, Cadoxton, Barry, and at 3, Vere Street, Cadoxton, Barry, Glam, as an electrical retailer.—Receiving order made 15th December on debtor's own petition.

STOCKS and SHARES

INDUSTRIAL share prices mostly finished 1952 below their starting level, but many gilt-edged securities have on balance held their value well. On the whole, the outcome of an eventful twelve months is widely conceded to be more satisfactory than many people had dared to hope at the beginning and certainly better than seemed at all likely up to half way through the period. The market revival in the second part of the year was particularly noteworthy in view of the raising of the Bank Rate to 4 per cent in March, a decision which automatically dropped again the whole platform on which security prices rest. Thereafter, however, the medicine began to work. As the formerly disastrous deterioration in the gold reserves and in overseas trade started to move into balance, confidence gradually returned into the Stock Exchange markets, making good at any rate the greater part of the earlier depreciation.

Gilt-Edged Stocks

In contrast with the previous year's experience, investors have done better during the past twelvemonth with British Government securities than with industrial ordinary shares. This reversed order of things seems a natural sequence to the operation of deflationary policies with their tendency to strengthen confidence in money while placing restrictions on trade and industry. All three of the senior British Electricity Stocks finished surprisingly close to their quotations of a year ago, and have had a steep climb since last June in order to do so. The 3 per cent stock dated 1968–73 finally ended 10s down at 84, having been 79 in the course of the journey. (In the previous twelve months, the price fell by 13 points.) The 3 per cent stock, 1974/77, at 83 and the 3½ per cent stock, 1976/79, at 89, show falls of 10s on balance, after similar experiences ; while the new 4½ per cent stock stands at 100, as compared with the price of 99 at which it was issued in April.

Electrical Equipment Shares

Industrial shares had, of course, to follow the gilt-edged market downwards on the change in Bank Rate early in the year. The fact that they have been less successful in recovering the lost ground seems best ascribed, in brief, to appreciation of the evidence that profits throughout industry have become much harder to earn than they were in the period of persistent inflation and sellers' markets. Few electrical equipment shares have escaped depreciation altogether, but they have again done noticeably better than the average industrial. This applies in particular to shares in the companies concerned largely with the capital equipment side of the industry. The following table of comparisons includes some of the best-known shares in this market:—

Company	End December 1951	End December 1952	Rise or Fall(b)
	s d	s d	s d
Associated Elec. Industries	83 9	75 0	— 8 9
Crabtree Elec. ..	34 6	31 3	— 3 3
Crompton Parkinson ..	10 0	8 9	— 1 3
Elec. Construction ..	57 6	50 0	— 7 6
English Elec.	58 9	59 0	+ 0 3
G.E.C.	45 9(a)	42 6	— 3 3
Lancashire Dynamo ..	43 9	42 6	— 1 3
Reyrolle	43 0	51 3	+ 8 3

Cables and Telephones

B.I.C.C. shares, with the aid of an increased dividend, have gained in value during the year, but they are an exception to the tendency of the cable and telephone manufacturing group to follow the general run of industrial shares:—

Company	End December 1951	End December 1952	Rise or Fall(b)
	s d	s d	s d
Automatic Telephone ..	63 9	58 9	— 5 0
B.I.C.C.	30 0	33 6	+ 3 6
Enfield Cable	27 6	22 0	— 5 6
Henley's	21 0	18 9	— 2 3
Johnson & Phillips ..	56 3	52 0	— 4 3
Siemens	39 6	34 6	— 5 6
Telegraph Construction	29 0(a)	26 0	— 3 0
Telephone Manufacturing	9 0	8 0	— 1 0

Miscellaneous Markets

Radio shares have had a mixed experience over the year. Generally speaking, the weakest points in the industrial market have been associated with the production of "consumer" goods and equipment. The comparatively good performance of companies in some of the heavier branches of engineering is apparent in the following table:—

Company	End December 1951	End December 1952	Rise or Fall(b)
	s d	s d	s d
Babcock & Wilcox ..	70 6	70 6	—
Cable & Wireless ..	117½	126½	+ 9 0
Cole, E. K.	18 0	16 9	— 1 3
Cossor, A. C.	14 0	9 3	— 4 9
Decca	17 0	17 9	+ 0 9
E.M.I.	18 0	13 3	— 4 9
Ever Ready	28 0	26 0	— 2 0
Hoover	27 3	23 3	— 4 0
Lucas	36 3	36 3	—
Murex	53 0	55 0	+ 2 0
Pye	18 0(a)	15 6	— 2 6
Tube Investments ..	55 0(a)	60 3	+ 5 3

(a) Adjusted for capital bonus.
(b) No allowance is made in the above tables for the value of "rights" issues during the year.

ELECTRICAL INVESTMENTS

Past Fortnight's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 29th Dec. 1952	Two Weeks' Rise or Fall	Est. Yield p.c.
Gilt-edged and Overseas Stocks			£ s d		
Brit. Elec. 1968/73	3	3	84	–½	3 11 6
Brit. Elec. 1974/77	3	3	83	–½	3 12 3
Brit. Elec. 1976/79	3½	3½	89	–½	3 18 8
Brit. Elec. 1974/79	—	4¼	100	—	4 5 8
Calcutta Elec. ..	6†	6†	20/-	—	6 0 0†
East African Power	7	7	22/6	+6d	6 4 6
Nigerian Elec. ..	10	10	21/3	—	—
Palestine Elec. "A"	5†	Nil	10/-	–1	—
Perak Hydro-Elec.	Nil	Nil	14/-	—	Nil
Equipment and Manufacturing					
AberdareCables(5/-)	20	20	14/9	+3d	6 15 6
Aerialite (1/-) ..	83½	88½	8/6	—	10 7 9
Allen, W. H. ..	15	15	41/9	—	—
Aron Elec. Ord. ..	15	15	37/6	+⅜	8 0 0
Assoc. Elec. Ord...	20	20	75/-	—	5 6 8
Automatic Tel. & El.	15	15	58/9	—	5 2 3
Babcock & Wilcox	18	18	70/6	+9d	5 2 3
Baldwin, H. J. (2/-)	25	20	3/6	—	11 8 9
Bakelite (10/-) ..	—	—	16/3	—	—
British Aluminium	10	12	43/3	—	5 10 10
B.I. Callender's ..	7½	9	33/6	+6d	5 7 6
British Thermostat (5/-)	30	30	28/9	+1/9	5 4 3
British Vac. Cleaner (5/-)	25	25	13/6	—	9 5 2
Brook Motors (10/-)	20	20	31/3	—	6 8 0
Brush Ord. (5/-) ..	10	10	5/-	—	10 0 0
A. F. Bulgin (1/-)..	27½	30	2/7½	—	11 8 6
Burco (5/-) ..	38½	35	18/9	–9d	9 6 9
Chloride El. Storage	15	15	62/6	+⅛	4 16 0
Cole, E. K. (5/-) ..	25	25*	16/9	–3d	7 9 3
Cossor, A. C. (5/-)	Nil	10	9/3	–9d	5 8 0
Crabtree (10/-) ..	17½	17½	31/3	—	5 12 0
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	8/9	—	—
De La Rue (5/-) ..	50	35*	8/6	+1/-	—
Decca (1/-) ..	112½	112½	17/9	–3d	6 6 9
Dewhurst (2/-) ..	22½	19*	5/-	—	7 12 0
Dictograph Tel. (2/-)	20	20	5/-	—	8 9 0
E.M.I. (10/-) ..	12	12	13/3	—	9 1 2
Electrical Components (5/-) ..	20	20	10/-	—	10 0 0
Elec. Construction	15	15	50/-	—	6 0 0
Enfield Cable Ord.	7½	7½	22/-	—	6 16 4
English Electric ..	15	15	59/-	—	5 1 8
Ericsson Tel. (5/-)	22††	22*††	40/9	—	2 14 0†
Ever Ready (5/-)..	35	35	26/-	—	6 14 8
Falk Stadelmann..	15	15	38/9	—	7 14 8
G.E.C. Ord. ..	22½	22½	42/6	—	5 6 0*
General Cables (5/-)	30	30	15/-	—	10 0 0
Greenwood & Batley	15	15	38/-	—	7 18 0
Hackbridge Cable (5/-)	20	20	10/3	—	9 15 0
Hackbridge Hewittic (5/-)	18	20	16/3	—	6 3 0
Hall Tel. Acc. (10/-)	10	10	9/3	–9d	10 16 2
Heatrae (2/-) ..	12½	12½	4/-	—	6 5 0
Henleys (5/-) ..	20	20	18/9	+6d	5 6 6
Holophane (5/-) ..	15	20*	11/3	—	8 17 10
Hoover (5/-) ..	37½	35*	23/3	—	7 10 6

Company	Dividend Previous	Dividend Last	Middle Price 29th Dec. 1952	Two Weeks' Rise or Fall	Est. Yield p.c.
Equipment and Manufacturing (continued)			£ s d		
Intl. Combustion (5/-)	20	25	12/-xb	–3d	—
Johnson & Phillips	15	15	52/-	—	5 15 5
Lancashire Dynamo	22½	12½*	42/6	—	5 17 8
Laurence,Scott(5/-)	12½	15	13/3	—	5 13 5
London Elec. Wire	12½	12½	51/3	—	4 17 6
J. Lucas	7½	9½	36/3	—	5 1 3
Marryat & S. (2/-)	22½	22½	5/-	—	9 0 0
Mather & Platt ..	12½	12½	40/9	–⅛	6 2 9
Metal Industries ..	10	15	40/9	–6d	—
Mid. Elec. Mfg. ..	15	15	55/-	—	5 9 1
Murex	12½	15	55/-	—	5 9 0
Newman Ind. (2/-)	6	10	2/3	—	8 17 10
Oldham & Son (1/-)	30	35	2/6	—	—
Parnall (Yate) (5/-)	6	6	3/9	–3d	8 0 0
Parsons, C. A. ..	15	10*	55/-	—	—
Plessey (5/-) ..	22½	25	21/3	—	5 17 9
Pye Deferred (5/-)	18	18	15/6	+1/-	—
Revo (10/-) ..	27½	27½	42/6	—	6 9 6
Reyrolle	15	10*	51/3	—	—
Scot. Cable (4/-) ..	30	32	11/3	—	—
Siemens Ord. ..	10	10	34/6	—	5 16 0
Strand Elec. (5/-)..	17½	17½	8/9	—	10 0 0
Sturtevant (5/-) ..	16½††	17½*††	24/-	+6d	—
Switchgear&Cowans (5/-)	22½	22½	15/6	+6d	7 5 3
Taylor T. (5/-) ..	20	20	19/3	—	5 4 0
T.C.C. (10/-) ..	20	20*	38/-	—	—
T.C. & M... ..	10	10	26/-	—	—
TelephoneMfg.(5/-)	10	10	8/-	—	—
Thorn. Elec. (5/-)..	10	12½	8/-	—	7 10 3
Tube Investments	25	15*	60/3	+3d	4 19 6
Vactric (5/-) ..	Nil	Nil	4/6	—	Nil
Veritys (5/-) ..	Nil	7½	4/9	—	7 18 0
Walsall Conduits (4/-)	70	70	46/-	—	—
Ward & Goldstone (5/-)	45	45*	39/9	—	—
Watford (2/-) ..	25	25	6/3	—	8 0 0
Westinghouse Brake	14	14	50/9	—	5 10 3
West, Allen (5/-) ..	12½	15	10/3	—	7 6 4
Trusts, Transport and Communications					
Anglo-Am. Tel.: A Ord. ..	—	6	79½	—	7 11 0
Ord.	—	3¾	55	—	6 16 3
Anglo-Portuguese	8	8	20/6	—	7 16 1
Brit.Elec.Traction: Def. Ord. ..	22½	25	425	—	5 17 8
Cable & Wireless: Ord.	6	8	126½	+3d	6 6 6
4% Loan	4	4	94½	–½	4 4 9
Calcutta Trams ..	6†	6†	23/-	+1/-	5 4 3†
Cape Elec. Trams	5	5½	10/-	—	11 0 0
Marconi Marine ..	10	10	30/6	—	6 11 3
Oriental Tel. Ord.	16	16	58/6	—	—
Telephone Props...	8	8	32/6	–¼	4 18 6
Tele. Rentals (5/-)	10	10	8/3	—	6 1 3

* After capital bonus.
† Dividends are paid free of Income Tax.

New Books

Material Handling in Works Stores: The Fork-Lift Truck and Pallet System. By L. J. Hoefkens. Pp. 108; figs. 49. Published for *Mechanical Handling* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 10s 6d.

We would have liked to have seen the word "applications" in the title of this book because in exhibition and factory we have heard the same type of questions asked so frequently: What type of system, equipment or component do I want for handling so many finished or partly finished products in my works? And very many of the answers are given in this little volume in the clearest manner imaginable.

In his introductory chapter the author lays it down as a fundamental principle that material should be handled in the largest convenient unit load, by the quickest method, over the shortest route; and this principle is certainly followed methodically throughout the sections: "Planning New Methods," "Receiving Department," "Raw Material Store," "Finished Part Store," "Finished Equipment Store," and "Material Movement Control."

By far the most practical section (and the largest) is No. 2, "Fork Trucks and Pallets." About half the illustrations in the book are in this section which renders it quickly informative in conjunction with the crisp descriptive notes. Perhaps Section No. 13 on "Swarf Handling" gets rather nearer processing than the author intended, but overlapping between storage and processing can occur with almost every type of equipment referred to.

The advantages of the electric drive in the store are so outstanding that they should have received greater emphasis.—P.W.T.

Lighting in Industry. Pp. 154; figs. 85; index. British Electrical Development Association, 2, Savoy Hill, London, W.C.2. Price 9s.

This book is the second in the Association's "Electricity and Productivity" series. It deals with factory lighting mainly from the point of view of the user, i.e., the works manager and executive, and does not purport to be a handbook on how to light a factory. That is the job of the lighting engineer but, as is pointed out, the expert can only advise. Decisions are made by others and unless these others are properly informed, at least on the general principles of the subject, there is no guarantee that what they decide will, in fact, give the best results. Probably the most useful function of the book is to reveal the enormous gap which so often exists between the actual lighting and what it might be if re-designed in accordance with modern good practice.

The style in which the book is written and produced is well suited to its purpose. There are a large number of excellent half-tone illustrations, the language is as free as possible from technical jargon and the paper and printing are excellent. A minor criticism is that the unit of illumination used throughout is the foot-candle. It is true that the legal requirements are so expressed but modern codes usually employ the lumen/sq ft and it would have been useful to draw attention to the identity of the two units at an early stage.—J.W.T.W.

Tensors in Electrical Machine Theory. By W. J. Gibbs, D.Sc., M.I.E.E. Pp. 238; figs. 36; bibliography and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 30s.

The author of this book has deviated from the normal opening by following a "classical" mathematical treatment, though his use of the term "matrix" without definition could be confusing. At the outset, subscripts and superscripts are used, before an explanation of covariance and contravariance; possibly this will help the student to appreciate the essential differences in the later stages. Naturally, the author had insufficient space to follow co-ordinate and polar transforms to explain this, although it would have been a help. Also the introduction of the Kronecker deltas is perhaps too academic.

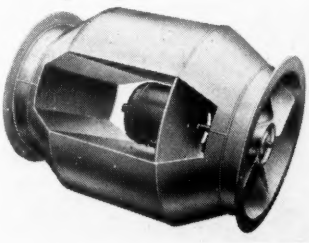
The electrical treatment is excellent, and there is no doubt that this should become a standard text-book on the subject. To illustrate the compactness of the methods, the Schrage motor is fully explained, with a numerical example, in seven pages: and provided that the earlier chapters have been mastered, the treatment is extremely simple to follow. The final sections deal with derivatives, holonomic and non-holonomic reference frames, and machine oscillation.—E.H.S.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

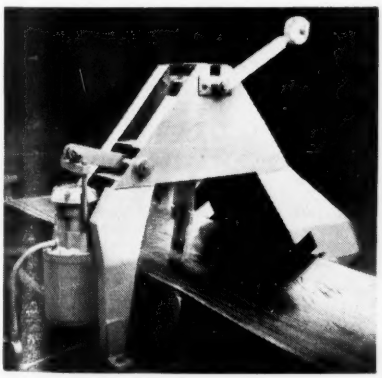
Bifurcated Fan Unit

AN addition to the range of "Tornado" fans made by KEITH BLACKMAN, LTD., Mill Mead Road, N.17, is a bifurcated unit for handling dust- or fume-laden air or gases. The fan casing is split across to provide a separate chamber for the driving motor, thus completely isolating it from the fumes. Four standard sizes are available, with fan diameters of 10, 12, 14 and 16in, and they are all suitable for operation at temperatures up to 150 deg F in the duct. For duct temperatures between 150 deg F and 350 deg F and a local ambient temperature not exceeding 90 deg F a standard unit can be supplied incorporating a motor chamber lined with insulating material and with bearings filled with high temperature grease.



Keith Blackman "Tornado" bifurcated fan

International Combustion coal sampler fitted to a 30in wide conveyor belt



Laboratory Switch Kit

It is announced that a kit for the manufacture of prototype "H" type switches is now available from A.B. METAL PRODUCTS, LTD., 16, Berkeley Street, London, W.1. It is housed in a handsome wooden cabinet and contains all the necessary piece parts and tools for the laboratory construction of prototype switches.

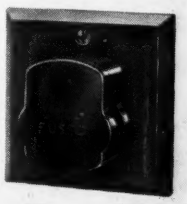
Coal Sampler

The necessity for accurate coal sampling in generating stations has resulted in the development of the patented "Pollock" sampler which has just been put on the market by INTERNATIONAL COMBUSTION, LTD., 19, Woburn Place, London, W.C.2. This device embodies a hinged scraper arm operated by a thrustor through a link mechanism carrying the scraper across the width of the conveyor belt. The scraper removes a cross-section of the material and delivers it into a side chute. The lower section of the scraper arm is hinged and spring loaded so that during the return movement of the arm the scraper rides back over the material without disturbing it.

This sampler, which can readily be applied to new and existing belt conveyor installations, meets the need for a simple, robust, inexpensive and easily maintained unit with dimensions least likely to affect any plant layout. It is not restricted to coal handling operations and may be used with a variety of other materials.

Fused Plugs and Sockets

We regret that in our note on the 13 A fused plugs and sockets introduced by T.M.C. HARWELL (SALES), LTD., the company's address was incorrectly given. It is 37, Upper Berkeley Street, London, W.1. A photograph of one of the new accessories is reproduced.



T.M.C. Harwell 13 A fused plug and socket

NEXT WEEK'S EVENTS

Monday, 5th January

BIRMINGHAM.—James Watt Institute, 6 p.m. I.E.E. South Midland Education Discussion Circle. "Post-Graduate Activities in Electrical Engineering," by W. J. Gibbs, D. Edmundson, R. G. A. Dimmick and G. S. C. Lucas. (Joint meeting with the South Midland Centre.)

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Supply Group. "The Use of Electricity in a Modern Iron and Steel Works," by W. F. Cartwright. (Joint meeting with the Western Centre and the Western Utilization Group.)

CHIPPENHAM.—Canteen of the Westinghouse Brake and Signal Co., Ltd., 7 p.m. I.E.E. Bristol Students' Section. "Electrification of Railways," by S. A. Kandil.

ILFORD.—Angel Hotel, 8 p.m. A.S.E.E. North-East London Branch. "The Principle of the Metadyne," by D. H. Taylor.

IPSWICH.—Crown and Anchor Hotel, 6.30 p.m. I.E.E. district meeting. "275 kV Developments on the British Grid System," by D. P. Sayers, Dr. J. S. Forrest and F. J. Lane.

LEEDS.—Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. "Contactor Type Switchgear."

LIVERPOOL.—Liverpool Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Uses of Earthed Signal Conductors on Transmission Circuits," by W. Casson.

LONDON.—Caxton Hall, S.W.1, 7 p.m. E.P.E.A. London Technical Group. "The Measurement of Insulation," by Dr. J. S. Forrest.

London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers, London Section. "The Modern Single-Layer Selenium Photocell," by G. A. Veszi.

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. "High-Gain d.c. Amplifiers," by K. Kandiah and D. E. Brown.

Tuesday, 6th January

BIRMINGHAM.—Imperial Hotel, Temple Street, 6.30 p.m. Engineers' Guild, West Midlands Branch. "Presentation of Technical Information," by Prof. R. O. Kapp.

BRISTOL.—Grand Hotel, Broad Street, 7.30 p.m. Institution of Engineering Inspection, South Western Branch. "Arc Welding" (with film), by G. G. Marshall.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 7.15 p.m. Incorporated Plant Engineers, South Wales Branch. "A Plant Engineer Tours America," by G. E. Halter.

EDINBURGH.—25, Charlotte Square, 7 p.m. Incorporated Plant Engineers, Edinburgh Branch. Members' evening.

ELTHAM.—Church Hall, Court Road, 8 p.m. A.S.E.E. South-East London Branch. "Electrostatic Precipitation," by S. L. Walker.

GLASGOW.—Royal Technical College, 7 p.m. Institute of Fuel, Scottish Section. "The Ridley Report and After," by G. Nabarro, M.P.

HAMMERSMITH.—134, King Street, W.6, 7.30 p.m. A.S.E.E. West London Branch. "Some Changes in Installation Practice during a Quarter of a Century," by J. Flood.

LEEDS.—1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Centre. "Electronic Telephone Exchanges," by T. K. Flowers.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurements and Radio Sections. "An Improved Scanning Electron Microscope for Opaque Specimens," by D. McMullan.

Royal Society of Arts, John Adam Street, Adelphi, 7 p.m. Incorporated Plant Engineers, London Branch. Discussion on the National Fuel Policy.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Centre. "The Characteristics and Control of Rectifier-Motor Variable-Speed Drives," by P. Bingley.

NOTTINGHAM.—Demonstration Theatre, E.M.E.B., Smithy Row, 7.30 p.m. A.S.E.E. Nottingham Branch. "Modern Fixing Practice," by R. P. Dunn.

Wednesday, 7th January

ABERDEEN.—Caledonian Hotel, 7.30 p.m. I.E.E. North Scotland Sub-Centre. "The Economics of Low-Voltage Supplies to New Housing Estates," by F. G. Copland.

BELFAST.—Queen's Hotel, Victoria Street, 7.30 p.m. Purchasing Officers' Association, Northern Ireland Group. "Electric Motors," by B. Chalmers.

BIRMINGHAM.—James Watt Institute, Great Charles Street, 7 p.m. Junior Institution of Engineers, Midland Section. Chairman's address, "Some Aspects of Modern Material Handling," by O. J. B. Orwin.

BRIGHTON.—Technical College, 6.30 p.m. I.E.E. Southern Centre. "275 kV Developments on the British Grid System," by D. P. Sayers, Dr. J. S. Forrest and F. J. Lane.

EDINBURGH.—City Lighting & Cleansing Dept., 357, High Street, 7 p.m. I.E.S. Edinburgh Centre. "Colour as a Framework to Industry," by Mrs. D. M. Buckland.

LONDON.—Illuminating Engineering Society. Visit to Croydon "B" power station.

MANCHESTER.—Engineers' Club, Albert Square, 6.30 p.m. I.E.E. North-Western Radio Group. "The Nervous System as a Communication Network," by J. A. V. Bates.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institute, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "Domes in Electrical Installations: Some Safety Aspects," by H. W. Swann.

NEWCASTLE-ON-TYNE.—Minor Durrant Hall, Oxford Street, 6.15 p.m. I.E.S. Newcastle Centre. "Museum and Art Gallery Lighting," by W. E. Rawson-Bottom.

SOUTHAMPTON.—Polygon Hotel, 7.30 p.m. Incorporated Plant Engineers. "Metallizing in Relation to Plant Maintenance," by J. Porter.

WOOD GREEN.—Three Jolly Butchers Hotel, N.22, 8.15 p.m. A.S.E.E. North London Branch. "Photo-Electric Cells and their Application."

Thursday, 8th January

DUNDEE.—Royal Hotel, at 7 p.m. I.E.E. North Scotland Sub-Centre. "The Economics of Low-Voltage Supplies to New Housing Estates," by F. G. Copland.

GLASGOW.—At 39, Elmbank Crescent, 6.30 p.m. I.E.S. Glasgow Centre. "Colour as a Framework to Industry," by Mrs. D. M. Buckland.

KENTON.—"The Plough," Kenton Road, 12.30 p.m. Institution of Works Managers, Wembley Sub-Branch. "Space Heating of Buildings and Conditions of Comfort," by Dr. E. H. Mundel.

LIVERPOOL.—At Electricity Showroom, Whitechapel, 7 p.m. E.P.E.A. Merseyside Technical Group. "Water Softening," by F. W. Dale.

LONDON.—Savoy Place, 4.30 p.m. Institution of Electrical Engineers. "Nuclear Reactors and Applications," by Sir John Cockcroft. 6 p.m. Symposium of papers on "Nuclear Reactor Instrumentation."

Polytechnic, Regent Street, W.1, 7.30 p.m. Institute of Industrial Supervisors, London Central Section. Annual general meeting and industrial film show.

MANCHESTER.—N.W.E.B., Town Hall Extension, 6 p.m. I.E.S. Manchester Centre. "Lighting in the Food Industry," by R. L. C. Tate.

NEWCASTLE-UPON-TYNE.—Roadway House, Oxford Street, 7.30 p.m. Incorporated Plant Engineers, Newcastle-upon-Tyne Branch. "Preventive Maintenance," by T. G. Robinson.

(*Continued at foot of page 53*)

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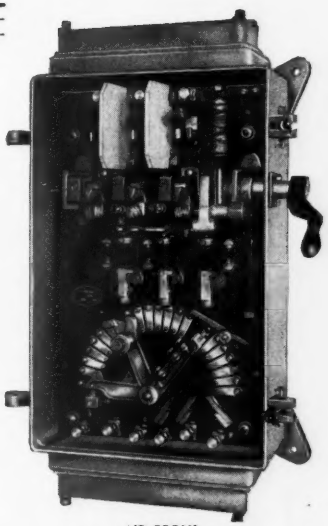

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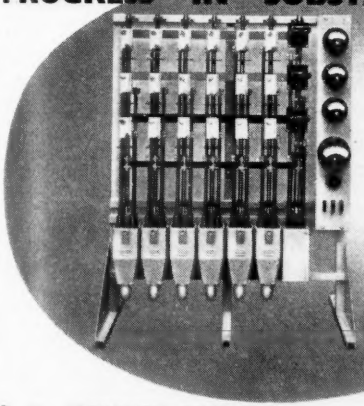
PROGRESS IN SUBSTATION L.T. SWITCHGEAR



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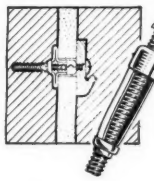

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 11th February from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

21844. British Thomson-Houston Co., Ltd.—Electric-discharge devices. 22nd July, 1946. (687261.)

1948

6697. Philips Electrical, Ltd.—Circuits for generating super-frequency electrical oscillations and discharge tubes for use therein. 3rd March, 1948. (687194.)

18938. Automatic Electric Laboratories, Inc. Automatic telephone exchange systems. 14th July, 1948. (687343.)

21921. General Electric Co., Ltd., and Francis, V. J.—Apparatus comprising an electric discharge lamp for producing flashes of light. 7th September, 1949. (687195.)

25557. Automatic Electric Laboratories, Inc.—Telephone exchange systems. 1st October, 1948. (687197.)

1949

5525. Prochazka, R.—Electrostatic generators. 1st March, 1949. (687271.)

6783. Speed Development Co., Ltd., and Ruffle, W. H. —Temperature change responsive means for controlling electric circuits. 11th October, 1949. (687136.)

15883. Bedil, M. F.—Variation of reactance in electrical induction apparatus. 13th September, 1950. (687138.)

17484. British Thomson-Houston Co., Ltd., and Whiteley, A. L.—Voltage regulators for electric generators. 28th June, 1950. (687351.)

18323. National Research Development Corporation. —Frequency control system for a motor-alternator. 10th October, 1950. (687411.)

18878. Metropolitan-Vickers Electrical Co., Ltd.—Photo-electric cells sensitive to light or heat. 25th May, 1950. (687198.)

20120. General Electric Co., Ltd., and Smyth, J. B. S. —Electric lanterns. 31st July, 1950. (687140.)

23646. Cossor, Ltd., A. C., Fleming-Williams, B. C., and Woodward, C. R.—Step-by-step electric motors. 28th August, 1950. (687199.)

23682. Lobbe, G.—Electric arc lamp circuits, more particularly for projecting pictures. 14th September, 1949. (687143.)

24160. Westinghouse Electric International Co.—Electrodeposition of nickel, cobalt, and nickel-cobalt alloys. 20th September, 1949. (687275.)

26158. Electric & Musical Industries, Ltd.—Manufacture of photo-electric devices. 26th September, 1950. (687200.)

26731. Basset, L. P.—Microporous graphite battery electrodes and methods of making same. 18th October, 1949. (687201.)

27554. Morecambe Electrical Equipment Co., Ltd., and Ellefsen, O.—Electromagnets. 5th October, 1950. (687202.)

27722. Standard Telephones & Cables, Ltd.—Travelling wave tube. 28th October, 1949. (687203.)

27810. Elektrokemisk Aktieselskap.—Electrodes and processes for their manufacture. 31st October, 1949. (687146.)

28597. Metropolitan-Vickers Electrical Co., Ltd.—Pyrometers. 22nd June, 1950. (687415.)

1950

593. Standard Telephones & Cables, Ltd.—Microwave amplifiers. 10th January, 1950. (687149.)

869. Simplex Electric Co., Ltd.—Grills. 20th December, 1950. (687150.)

1551. English Electric Co., Ltd.—Coil formers. 19th January, 1951. (687151.)

2089. General Electric Co., Ltd., and Rutenberg, A.—Means for producing pulses of alternating current from d.c. impulses. 6th March, 1951. (687205.)

4729. Metropolitan-Vickers Electrical Co., Ltd.—Electron microscopes. 5th January, 1951. (687207.)

5433. Dynamo & Motor Repairs, Ltd., and Tyler, G. T.—Signal tone generators used in telephony. 1st March, 1951. (687208.)

7117. Automatic Telephone & Electric Co., Ltd.—Telephone systems. 19th March, 1951. (687156.)

7721. Standard Telephones & Cables, Ltd.—Cathode-ray tubes. 28th March, 1950. (687157.)

8174. Metropolitan-Vickers Electrical Co., Ltd.—Electric heating apparatus. 12th January, 1951. (687361.)

8476. Thermionic Products, Ltd.—Magnetic recording and reproducing apparatus. 30th March, 1951. (687287.)

9753. British Insulated Callender's Cables, Ltd.—Stranding machines. 19th April, 1951. (687289.)

19707. Hansen, H. C.—Electrodynamic pick-ups. 1st May, 1950. (687363.)

11806. Techag Akt.-Ges.—Electric grills. 11th May, 1950. (687211.)

14458. British Tabulating Machine Co., Ltd., and Bowyer, A. W.—Electronic adding devices. 13th August, 1951. (687366.)

14771. British Thermostat Co., Ltd.—Thermally-operated electric switches or relays. 12th June, 1951. (687294.)

NEXT WEEK'S EVENTS

Thursday, 8th January *(continued)*

NOTTINGHAM. — Demonstration Theatre, E.M.E.B., Smithy Row, 6 p.m. I.E.S. Nottingham Centre. "Student Members' Viewpoints," by J. Eddyshaw, W. Mosedale, N. S. Rutherford and J. R. Wakefield.

WORCESTER. — Talbot Hotel, Tything, 7.15 p.m. Worcester Electric Club. "Control by Contactors," by K. N. Swash.

Friday, 9th January

BIRMINGHAM.—I.E.S. Birmingham Centre. Annual dinner.

CREWE.—Royal Hotel, Nantwich Road, 7.30 p.m. A.S.E.E., Crewe Branch. "Small Transformer Design," by C. N. W. Reece.

EXETER.—Imperial Hotel. Exeter Electric Club. Annual dinner-dance.

KENILWORTH.—Chesford Grange. I.E.E. Rugby Sub-Centre. Rugby engineers' ball.

LIVERPOOL.—9, The Temple, Dale Street, 7.30 p.m. A.S.E.E. Liverpool Branch. "Modern Fixing Practice," by H. T. Springings.

LONDON.—Townsend House, Greycoat Place, 7 p.m. Junior Institution of Engineers. "Automatic Feed Press-working," by C. H. Crawford.

NEWCASTLE-ON-TYNE.—Mining Institute, 6.15 p.m. North East Coast Institution of Engineers and Shipbuilders. "Marine Steam Turbines," by J. Brown.

STAFFORD.—Oddfellows' Hall, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "275 kV Developments on the British Grid System," by D. P. Sayers, Dr. J. S. Forrest and F. J. Lane.

14911. Siemens & Halske Akt.-Ges.—Transistors. 14th June, 1950. (687162.)

15784. Tourtellier, M.—Electrical monorail installations. 23rd June, 1950. (687367.)

16184. Krefft, H. E.—Seal for electrical discharge devices. 28th June, 1950. (687297.)

16790. Qualcraft General Engineering Products, Ltd., and Williams, E. B.—Combined control and signalling apparatus. 25th May, 1951. (687428.)

19165. C.A.V., Ltd.—Electrical door-actuating apparatus. 14th June, 1951. (687169.)

20216. Western Precipitation Corporation. Apparatus for introducing air or other gaseous fluid into an electrical precipitator. 15th August, 1950. (687431.)

20320. Soc. d'Electricité Mors.—Shock-indicating device. 16th August, 1950. (687373.)

20599. Crabtree & Co., Ltd., J. A., and Hill, W. E.—Electric fuse holders.—23rd July, 1951. (687216.)

20843. Patelhold Patentverwertungs- & Elektro-Holding Akt.-Ges.—Pulse modulated wireless multi-channel transmission systems. 23rd August, 1950. (687174.)

22738. Electrical Apparatus Co., Ltd., Walton, J. R., and Woodger, F. N.—Electromagnetically-operated switches. 2nd August, 1951. (687433.)

23860. Cinema-Television, Ltd.—Electronic voltage stabilizers. 28th September, 1951. (687219.)

23940. Marconi's Wireless Telegraph Co., Ltd.—Distorting amplifiers for use in television systems. 15th June, 1951. (687376.)

26761. Gaylor, P. J.—Electrolytic regeneration of spent caustic. 2nd November, 1950. (687381.)

27126. Zeiss-Opton Optische Werke Oberkochen Ges. —Electron microscope. 6th November, 1950. (687308.)

30472. Kampnagel Akt.-Ges. Vorm. Nagel & Kaemp. —Electric motor driven brake actuators. 13th December, 1950. (687222.)

31042. Metropolitan-Vickers Electrical Co., Ltd.—Electric cable jackets. 20th December, 1950. (687384.)

1951

424. British Thomson-Houston Co., Ltd.—Thermo-sensitive resistors or resistance elements. 5th January, 1951. (687188.)

2894. Standard Telephones & Cables, Ltd.—Electric-discharge devices. 6th February, 1951. (687225.)

3829. Philco Corporation.—Luminescent product and method of making same. 16th February, 1951. (687191.)

5260. British Thomson-Houston Co., Ltd.—Liquid irradiating apparatus. 5th March, 1951. (687388.)

7082. Automatic Electric Laboratories, Inc.—Apparatus and method for utilizing the hall effect. 27th March, 1951. (687236.)

7234. Pyror, Ltd.—Electrode structures. 28th March, 1951. (687237.)

7319. Machlett Laboratories, Inc.—Electron-discharge devices. 29th March, 1951. (687238.)

9879. Ateliers de Constructions Electriques de Charleroi.—High or medium frequency heating device for bolts, screws and other mechanical parts. 27th April, 1951. (687447.)

13903. Philips Electrical Industries, Ltd.—Holders for miniature thermionic valves and other small sized electrical apparatus having contact pins. 12th June, 1951. (687249.)

19367. Automatic Electric Laboratories, Inc.—Telephone exchange systems. 14th July, 1948. (687397.)

19724. Schenck Maschinenfabrik Darmstadt Ges., C. —Combined electro-magnetic and hydraulic dynamometer. 21st August, 1951. (687462.)

20600. Standard Telephones & Cables, Ltd.—Device for automatic frequency control more particularly for the reception of carrier shift signals. 31st August, 1951. (687330.)

20935. Erie Resistor Corporation.—Condenser. 5th September, 1951. (687463.)

21257. Forges et Ateliers de Constructions Electriques de Jeumont.—Electrically-operated visible signal device. 10th September, 1951. (687331.)

21258. Forges et Ateliers de Constructions Electriques de Jeumont.—High-tension and extra high-tension electric cables. 10th September, 1951. (687464.) 23213.—Multiple contact electric relays. 5th October, 1951. (687332.)

23400. Compagnie pour la Fabrication des Compteurs et Mat riel d'Usines à Gaz.—Receiving relays for remote control. 8th October, 1951. (687333.)

24354. Rheostatic Co., Ltd., and Chinn, A. J.—Safety switches for electrically heated appliances. 18th October, 1951. (687258.)

24488. Busch-Jaeger Lüdenscheider Metallwerke Akt.-Ges.—Contacts of rotary electric switches. 19th October, 1951. (687400.)

24852. Concordia Electric Safety Lamp Co., Ltd., and Steadman, C. H.—Transformer circuits. 24th October, 1951. (687468.)

25096. Standard Telephones & Cables, Ltd.—Circuit arrangement generating saw-tooth current waves. 26th October, 1951. (687469.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 24th January:—

PARVALUX. No. 710,203, Class 7. Electric motors for driving machines and mechanical appliances, and electric motors incorporating reduction gear drives: none being for use with land vehicles.—Parvalux, Ltd., Broom Road, Parkstone, Dorset.

VACMASTER (design). No. 708,030, Class 9. Electric vacuum cleaning machines and electric domestic polishing machines and parts of all such machines included in Class 9.—Vorwerk & Co., Wuppertal-Barmen, Germany. Address for service, c/o H. A. L. Venner, 1, Great James Street, Bedford Row, London, W.C.1.

TIFFEE. No. 711,746, Class 9. Electric kettles and electrical apparatus incorporating automatic mechanism for use in making hot beverages.—L. G. Hawkins & Co., Ltd., 30–35, Drury Lane, Kingsway, London, W.C.2.

PANTHA. No. 711,044, Class 9. Parts and fittings included in Class 9 of electrical instruments and apparatus, but not including insulated electric wire.—Leonard Heys, Ltd., Faraday House, Henry Street, Blackpool.

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CONTRACT INFORMATION

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CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Belgium.—BRUSSELS.—30th January. Service des Approvisionnements du Ministère des Colonies. Two 300 kVA transformers, transformer boxes and electric cables for the Belgian Congo. (C.R.E. 42403/52. Ten/5353.)*

7th January. Belgian Telegraph and Telephone Administration. Supply of electric cables. (C.R.E. 42402/52. Ten/5392.)*

Ceylon.—30th January. Government Post and Telecommunication Department. Equipment for a radio telephone service for H.M. Customs Department. (C.R.E. 42309/52. Ten/5346.)*

Fareham.—21st January. — Urban District Council. Supply of electrical fittings for one year. Surveyor, Westbury Manor, Fareham, Hants.

Hertfordshire. — 21st January. County Council. Electric lamps for one year. Central purchasing officer, The Old Rectory, Hatfield.

India.—NEW DELHI.—21st January. Directorate General of Supplies and Disposals. Detectors, expanders and repeaters, elements, primary cells, etc. (C.R.E. 42492/52. Ten/5379.)*

London. — CAMBERWELL. — 12th January. Borough Council. Electric lamps for one year. Borough engineer, Town Hall, S.E.5.

WANDSWORTH. — 21st January. Borough Council. Street lighting equipment. (See this issue.)

Mirfield.—12th January. U.D.C. Illumination of pedestrian crossing beacons. (See this issue.)

Morecambe and Heysham.—6th January. Borough Council. Installation of electricity to 12 flats on the Blackberry Hall site. Borough surveyor, Town Hall, Morecambe.

New Zealand.—WELLINGTON.—27th January. Director-General (Stores Division), G.P.O. Supply of resistors and condensers. (C.R.E. 41806/52. Ten/5341.)* 3rd February. Supply of copper wire. (C.R.E 42673/52. Ten/5365.)*

14th April. State Hydro-Electric Department. 15 MVA. 11 kV switchgear for the Motupipi substation. (C.R.E. 42674/52. Ten/5378.)*

Oldbury.—7th January. Borough Council. Supply of fluorescent lamp fittings for the Municipal Buildings, Surveyor's and Education Departments. Borough surveyor, Municipal Buildings.

Peterborough.—10th January. City Council. Electric lighting and power installations for 116 houses, Dogsthorpe North estate. (See this issue.)

28th January. Joint Education Board. Electrical installation for new premises for Wittering C.E. School. (See this issue.)

Ruislip-Northwood.—24th January. Urban District Council. Supply of electric lamps for one year. Surveyor, Council Offices, Northwood, Middlesex.

Salford.—31st January. Corporation. Electrical stores, etc., for one year. (See this issue.)

South Africa. — JOHANNESBURG. — 12th January City Council. Supply of distribution transformers. (C.R.E. 42716/52. Ten/5377.)* Supply of 1,000 porcelain disc type string insulator units. (C.R.E. 42730/52. Ten/5381.)*

West Lancashire.—31st January. R.D.C. Street lighting equipment. (See this issue.)

West Riding.—26th January. County Council. Reinstatement of electrical installation at the Castleford Whitwood Mining and Technical College. (See this issue.)

ORDERS PLACED

London.—LEWISHAM.—Housing Committee. Electrical installations in first stage of Ladywell Park housing scheme (£753).—Brakefields, Ltd.

CHELSEA.—Borough Council Housing Committee. Recommended. Electrification works at the Old Pond House (£1,993).—Rawlings Bros., Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barrow-in-Furness. — Police station and Courts at Rumsden Square, borough engineer.

Bewdley. — Secondary modern school, for Worcestershire E.C.; F. R. S. Yorke, Rosenberg & Mardall, architects, 2, Hyde Park Place, London, W.2.

Birmingham.—Two-storey office building at Argyle Street, Nechells, for M. B. Wild & Co., Ltd.; Aplin Bros., 91/93, Mount Street, Nechells.

Blyth.—Flats, north of Lavercock Hall Road; borough engineer, Municipal Buildings.

Bognor Regis.—Hostel for Training College for Teachers; county architect, County Hall, Chichester.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

Boreham Wood.—School and health clinic at Saffron Green (£57,361); Hertfordshire county architect.

Bournemouth.—Junior and infants' schools, West Howe; borough architect.

Brentford.—New factory; R. T. Thorpe, Ltd., Plough Yard, High Street.

Bridgwater. — Pumping station, Athelney; Somerset River Board (E. L. Kelting, chief engineer), Watergate House, Bridgwater.

Brierfield.—Houses (29), Coronation Road, Parson Clough estate; H. L. Smith, clerk to U.D.C., Town Hall.

Brixham.—Houses and bungalows (60), Penn Valley estate; Couldrey & Son, architects to U.D.C., 14, Palace Avenue, Paignton.

Cheam.—Houses (20), The Dene; Cheam Warren Estate Co., 56, Manor Road.

Chepstow.—Houses (44), Portskewett; S. Thomas, architect, 26, Commercial Street, Newport, Mon.

Coventry.—First stage of new omnibus garage (£160,000); city architect.

Extensions; Brighton Manufacturing Co., Ltd., Meteor Works.

Crawley New Town.—Printing works, etc., for Lloyd's Register Printing House; Gardiner & Theobald, architects, etc., 24, Bedford Square, London, W.C.1.

Crayford.—Eight shops, four flats and six maisonnettes; U.D.C. surveyor.

Daventry.—Houses (28), West Haddon, for R.D.C.; T. Wilson & Son, Ltd., Northampton.

Depwade.—Dwellings (54) for R.D.C.; A. F. Scott & Sons, architects, 23, Tombland, Norwich.

Doncaster. — Works extensions; Kenneth Thelwall, Ltd., Churchill Road.

Epping. — Houses (37), Beaconfield estate; B. Hiscott, clerk, Urban Council Offices, 91, High Street.

Eston (Yorks).—Infants' school for North Riding E.C.; J. Breakwell, architect, 7, La Motte Street, St. Helier, Jersey, Channel Isles.

Gateshead.—Flats (200), Barn Close area; chief architect, Municipal Buildings.

Halifax.—Three-storey flats at Illingworth South estate; E. & T. Bower, Ltd., Rookery Lane (84) and J. Walker & Sons, Ltd., High Road Well (12).

Hereford.—Occupational centre for mental defectives on site at Barrs Court Road; county architect, Hereford.

Ilkeston.—Houses (50), Kirk Hallam estate; borough engineer.

Kettering.—Houses (400) on land near Warkton Lane (plans and layout provisionally approved); Drury & Co., Ltd., Windmill Avenue.

Linslade.—Housing scheme on site in Mentmore Road; H. A. Rolls, architect to U.D.C., 15, Bridge Street, Leighton Buzzard.

Liverpool. — Rebuilding Corn Exchange (£500,000); H. H. Davies, architect, Liverpool.

Llanrwst.—Houses (20) for U.D.C.; Williams Bros., Ltd., Llanrwst.

London.—BERMONDSEY.—Extension of Guy's Hospital; Young & Hall, architects, 9, Southampton Row, W.C.1.

CATFORD.—Reinstatement of Downham Library; Lewisham borough architect.

FOREST HILL.—Flats (14) and six maisonnettes, Brockley Park; A. Roberts & Co., Ltd., 79, Eccleston Square, S.W.1.

HAMPSTEAD.—Shops, flats and garages, Dennington Park Road and West End Lane; town clerk, Town Hall, Haverstock Hill, N.W.3.

HOLBORN. — Flats (30), Endsleigh Street; borough architect.

ISLINGTON.—Rebuilding St. Mary's Church, Upper Street; Dove Bros., Ltd., builders, Cloudesley Place, N.1.

Margate.—Houses (400), Dane Valley Road area; W. L. Armstrong, borough surveyor, 38, Grosvenor Place.

Melton & Belvoir.—Houses (174); R.D.C. architect, Melton.

Newcastle-on-Tyne. — Motor showrooms, Northumberland Road, for Murray & Charleton, Ltd.; E. M. Lawson, architect, Barras Buildings, Barras Bridge, Newcastle.

Conversion of Nos. 1-5, Forth Lane into offices for the N.C.B.; Board's Architects' Department, Ashfield Tower, Gosforth, Newcastle.

Prescot.—Flats (50), Scotchbarn Lane and High Hill; Martin Cowley, Ltd., builders, Clay Cross.

Ramsgate.—Flats (18), Pretedge Avenue; W. W. Martin, Dane Park Road.

Reading.—Scheme for erection of civic centre in several stages, to include municipal offices, assembly halls, law courts, theatre, art centre, etc., on site in London Road; G. F. Darlow, town clerk, Town Hall.

Reigate.—Houses (53), Green Lane estate, Redhill; borough surveyor, Town Hall.

St. Albans.—Shops with flats over on sites at St. Julian's and New Greens; city engineer, 16, St. Peter's Street.

South Shields.—Houses (2,039), Whiteleas site; J. Reid, borough engineer, Town Hall.

Surbiton.—Shops (16) and flats (48), Bridge Road and Moor Lane; G. T. Crouch, Ltd., 3/5, Thames Street, Kingston-on-Thames.

Sutton Coldfield.—Factory, Reddicap Hill; Lampert Productions, 43, Boldmere Road.

Sutton-on-Hull.—Two nurses' hostels at the Sutton branch of Hull Royal Infirmary, for Leeds Regional Hospital Board; architect to the Board, Park Parade, Harrogate.

Swaffham.—Secondary modern school; G. W. Oak, architect, Stracey Road, Norwich.

Wem (Shrewsbury).—Dwellings (32), New Street; J. H. Grindall & Sons, builders, High Street.

West Bromwich.—Works extensions; Temperset, Ltd., Great Bridge Street.

Wigan.—Extensions to Public Baths; borough engineer.

York.—Restoration and rebuilding works at Guildhall; Milner & Craze, architects, 3, Buckingham Gate, S.W.1.